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Scrap for the Scrap

No section of the community has a better appreciation of the value of scrap than those associated with the foundry industry. From the day the first casting was made, the founder sought to utilise the runners and risers essential for its confection. Later he adapted his methods to incorporate as an esteemed raw material the metallic discard of the industries he serviced. The older type of foundryman was, as he could well afford to be, discriminating in the selection of the type of scrap he would use. To-day conditions have changed, and there are available excellent refined pig-irons, which, though based on scrap rather than iron ore, are compounded and processed so intelligently and with such a wealth of experience that they can "carry" just as much, if not more, common scrap than virgin pigs. Moreover, they can, and should, replace hematite iron wherever possible, as obviously the source of supply is domestically much greater. There are still too many foundrymen who will utilise their stocks of rarer materials on the optimistic premise that, when these are exhausted, they will easily get further supplies, and in any case they could, if it came to a showdown, manage with the more easily obtainable irons. The time has arrived when they should regard these rarer materials as an emergency ration; that is, if they experience a run of bad castings, they can for the period of investigation return to their previous practice.

The raw material of our industry is *paper*, and whilst in general our thought output is very largely of foundry matters, there are times when the question of our raw material exercises our mind, and for a space we propose to "reverse engines" and ask our readers to help us. It is no secret that the country is desperately short of paper and needs every square inch that can be saved. Just as there are many types of cast-iron scrap, so, too, there are many kinds of paper, and it so happens that the material that can be yielded up for re-use is the better sort. If we judge correctly, there must exist very large quantities of old account books, and equally formidable accumulations embraced within those dozens of letter files. These simply must be handed over to the local salvage department and, should any individual or firm experience any difficulty as to collection, a note addressed to us personally will ensure the case being taken up officially with a minimum delay of time. Not only is paper required as raw material for the printing trades, but it is equally essential in the make-up of munitions, and a Government department has published some astronomical figures of its direct consumption in war industries. Although unable personally either to visualise or appreciate very large figures, we cannot refrain from quoting some of the more easily-grasped figures given by the Ministry of Supply. According to their computation, one ton of paper can be turned into one or other of the following quantities of munitions: 1,500 shell containers; 9,000 shell fuse components; 11,000 mine assemblies; 71,000 dust covers for aero-engines; 36,000 cut-out targets, or 3,000 boxes for aero-cannon shells. These figures are formidable and will surprise even the most scrap-conscious foundryman who has realised in practice, more than most fabricators, the immense economic value of scrap in his own industry. The sketchiest consideration of these figures will, we are sure, act as a strong fillip to our numerous friends in the industry not only to salve their hidden resources of paper, but to be parsimonious in its use. The re-use of envelopes; the discontinuance of adhesive labels on parcels; the use of both sides of duplicating paper where possible; the change of systems so as to reduce the number of copies of orders to an absolute minimum. These are just a few of the potential savings that can be effected, and we are reasonably certain that in each organisation many others will occur to the mind. As a final appeal, we would reiterate that scrap paper has the same war potential as scrap iron and steel, and must be conserved for the use of the military machine with equal diligence.

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The Swarf Problem

BY "ONLOOKER"

Reality has at last emerged from rumours regarding possible action by the authorities on the question of scrap metal accumulations in this country. It takes the form of an instruction to makers of brass rod and is aimed at brass swarf which is generally supposed to comprise the hard core of this problem. From now on manufacturers of the B.S.S. 249 specification are required to use billets containing a minimum of 33⅓ per cent. swarf provided that they are able to acquire the requisite quantity of a suitable quality. Whatever degree of success is ultimately attained in this matter this step by the Control must be acclaimed as an example of benevolent interference by Authority, which might well as a matter of fact have been taken earlier. As a body the scrap metal merchants certainly have no reason to complain of harsh treatment under conditions of wartime trading, for they have been allowed to carry on business with a minimum of restriction on normal activity, and the present development is certainly not aimed at them. Rather the reverse, for demand should improve as a result of the Control's instruction.

If, however, the intake of swarf by the rod manufacturers is to be increased, it is necessary that closer attention should be paid to segregation of this material as it arises at the various cutting-up points, for once contamination has taken place, harm has been done which it may be commercially impossible to rectify. In any case the removal of impurities is costly both in time and money, and it is definitely preferable that by attention to the separation of one quality from another during the cutting-up process the risk of trouble later on should be eliminated. To the foundryman all scrap is suspect but swarf perhaps more than other types, for in its untreated state it contains a high proportion of moisture and is unlikely to be free from tramp iron. If, in addition, there is present only a small quantity of aluminium or manganese, due to lack of adequate supervision, then there cannot be any question of absorbing such material in the proportion desired by the Control. Although much can be done towards solving the swarf problem by separation of the different qualities at the source of production, the difficulties inherent in the process of introducing this light scrap directly into a charge of metal are such that preliminary treatment would appear to be necessary. After magnetting, the swarf may be run down into ingots or pigs, and it is not out of the question that during this melt steps can be taken to eliminate aluminium.

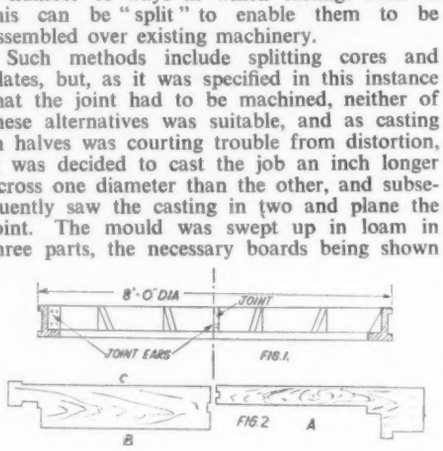
From the foregoing it is evident that the particular problem confronting the industry can only be solved by the exercise of the closest possible scrutiny all along the line and even then it is not going to be easy. Swarf, it must be emphasised, is essentially an awkward handling proposition and it is only by introducing an interim process, such as briquetting under pressure or melting into pigs, that really large tonnages can be absorbed as part of everyday works practice. Moreover, a strict check must be kept upon impurities, for unless these are controlled within proper limits there is bound to be trouble, and in view of the nature of the products being turned out to-day this certainly must not be allowed to happen. In conclusion, thought must be given to the risk of slowing down production through the use of too high a proportion of "difficult" material, and in view of the present situation it is evident that an increase and not a decrease in output is what the Government desires. There are, of course, considerations of our general metal supply position, and since the Control, with full knowledge of this, is pressing for greater consumption of swarf it is up to the manufacturers to do their best to respond.

Some Jobbing Foundry Experiences—XXIX

By "TRAMP"

Most foundrymen have had experiences with castings distorting on cooling due to their shape or design. The following note deals with a method of overcoming a trouble by anticipating it and adopting means to counteract it. Semi-circular castings are always prone to distortion, the open end tending to become wider rather than contracting to the normal allowance, and when a brake race as Fig. 1 was required in halves with a machined joint the foundry was set a problem to avoid distortion. There are a number of ways in which castings such as this can be "split" to enable them to be assembled over existing machinery.

Such methods include splitting cores and plates, but, as it was specified in this instance that the joint had to be machined, neither of these alternatives was suitable, and as casting in halves was courting trouble from distortion, it was decided to cast the job an inch longer across one diameter than the other, and subsequently saw the casting in two and plane the joint. The mould was swept up in loam in three parts, the necessary boards being shown



in Fig. 2. A strikes the bottom, B the ring and C the cope.

Suitable brackets are built in the bottom while two special pieces twice the thickness required plus one inch, are necessary to form the ears by which the finished castings are bolted together. To make the machining allowance, means must be adopted to strike one-half of the mould and then slide over one inch and strike the other half. Fig. 3 is a sketch of a rig used to strike moulds up to 3-in. eccentric. It consists of a base A in which a footstep B suits with a good sliding fit. The method of using is to strike one half with the footstep against one end and then slide it over to the other. In the present case, as only 1 in. was required, a piece as Fig. 4 was used between the footstep and one end, the piece being 1 in. wide at X; the piece Y is for ease in positioning it.

Control of Machine Tools

The Control of Machine Tools (No. 9) Order, 1941, made by the Minister of Supply, came into operation on November 18. It is intended to ensure that machine tools are used to full capacity in furtherance of the war effort. In accordance with the provisions of the Order every person in the United Kingdom who has had in his possession or control certain specified types of machine tools that have not been worked for more than 60 hours in the aggregate for any period of 60 consecutive days is required to furnish particulars of such machines to the Machine Tool Control, 35, Old Queen Street, London, S.W.1. The particulars must be furnished within seven days of the period laid down, and the person having possession or control must not move a machine except under licence or a special direction given by the Minister of Supply.

Random Shots

There is so much that the Censor will not let one say now-a-days that it sometimes cramps one's style; but not always! In the early days of the blitz, when localities of bombed areas were not to be mentioned, "Marksman" well remembers a local newspaper referring to the river Thames as a "certain stretch of water known as the father of all rivers." Similarly, when gossipers idly ask where the B.C.I.R.A. is making its new headquarters, one could say that it is near, if not actually on, property once owned by an ancient Cistercian Abbey, long since demolished. That Abbey had in its possession the extensive lands of Teneshala, Terdebigga, and Bordesleia; not to mention the whole land of Helweia, all the easements in the Forest of Feckeham, the whole lordship of Northune, the new pit of Wich, and one fishery at Ernelei!

* * *

Incidentally, the Abbey had its "ghost," all complete, in the form of a black dog, which was popularly supposed to be the restless spirit of a fourteenth century Earl of Warwick, affectionately known as the Black Dog of Arden. After a life of blood and revenge, he left rich benefactions to this Abbey for the provision of masses for the repose of his soul after his death. The "grim black hound" was supposed to have been seen by night watchers during the excavation of the Abbey ruins. It is to be hoped, for the peace of mind of the B.C.I.R.A.'s scientific workers, that the bad Earl's unquiet soul is now fully appeased and will not prowl round their grounds whining and howling on the dark and stormy nights of mid-winter in the hope that modern science can work its release from purgatory where contributions to the church funds failed way back in the fourteenth century.

* * *

Whilst the thoughts are still in the Birmingham district, it is appropriate to remember that the present day problems which the black-out presents to the meetings of scientific societies are by no means peculiar to this age. That earlier scientific society which functioned in Birmingham during the heyday of the Soho works of Matthew Boulton's time, was alternatively known as the Soho Circle and the Lunar Club; from which it can be gathered that meetings were held only on moonlight nights because of the dangerous condition of the dark streets. It is interesting to remember that amongst the scientists and engineers who were drawn together by the magnetic personality of Boulton and of George Watts was Murdoch, who himself invented the means of overcoming the great bugbear of the nightly black-out by the introduction of lighting by gas.

* * *

A crossword clue from this week's "Sunday Times" has quite a foundry flavour.

Clue: Their town in Kent.

Answer: Erith.

"MARKSMAN."

Bibliography on Blast Cleaning

A bibliography on blast cleaning with metallic abrasives has been compiled by RALPH HOPP, of the Carnegie Library of Pittsburgh, and is published in "Heat Treating and Forging." The bibliography has been confined to literature pertaining to the use of metallic abrasives impelled either by compressed air or centrifugal force. It includes references to material on the subject from the time of the invention of the sand-blast by Tilghman in 1870, to April, 1940. During this time the terminology has varied somewhat and for many years blast cleaning with metallic abrasives continued to be termed "sand-blasting." Recently, however, new terms such as "impact cleaning" and "blast cleaning" have come into use. Many references to articles in the "Foundry Trade Journal" are included.

Salvage and Disposal of Foundry Waste*

By Wm. Y. BUCHANAN

In elementary chemistry it is an axiom that matter is indestructible; in short, even during combustion the materials burnt merely change their form. With this thought in mind one is apt to find many so-called waste materials capable of further use, although of course the market values usually have the casting vote in the matter.

Market values fluctuate from time to time sometimes with good reason and often without, and the value of recovered materials is therefore a question which must be considered periodically. Salvage must be considered as distinct from disposal, and salvage at present is very much a matter of public discussion.

In considering the subject of salvage it is rather difficult to draw a dividing line between salvage and economy. For example, a more economic use of a material may be said to result in the salvage of what was previously wasted. However, for the present it is proposed to adhere to what is strictly salvage, and take those departments of the foundry which have materials to dispose of and see how far it is possible to use these, taking the writer's own experience as a basis for discussion.

The waste materials likely to be worth consideration may be listed under the following headings:—

Melting.—Coke and metal from drop; coke breeze and small coke from bins; material from roofs and dust catchers; slag; firebricks.

Sand Plant.—Metal from oversize delivery; silt; material recovered by magnetic separation.

Dressing.—Core sand and moulding sand; core wires, grids, small iron and sprigs; dust from grinders, etc.

Drying Plant—Clinker and ashes from stoves and portable driers; coal ashes from ladles.

Moulding.—Lifters and hangers, etc. (C.I. or M.S.); recovery of oil-sand cores.

Moulding Shop.—Cast iron and steel borings; abrasive wheels.

Melting

Coke and Metal from Drop.—There are machines on the market for wet grinding the cupola drop, in which the object is to grind up all but the metal, and this is washed clean with a continuous stream of circulated water. The machines consist of a steel barrel resembling a rumbler in which a heavy cylinder of metal rolls over the material to be treated. If this were made continuous in operation it would no doubt be simple to work and show a good profit.

To separate coke, however, the only available method is hand-picking, by which coke and metal can be recovered separately. The coke thus recovered is used for its primary purpose principally in the cupola remelting recovered metal. The iron recovered is, of course, to a large extent mixed with slag, and advantage is taken of this to ensure a large slag volume in the remelting process; indeed, slag is often added to the charge to make up any temporary deficiency.

Coke breeze gradually accumulates in bins, where coke is unloaded out of a truck and the loading done of the outside edge of the heap. There seems little application for this unless in specially designed firing units. It may, however, be used as a hot-top cover for large feeding heads with or without gentle air blast.

Coke too small for cupola melting, but over, say, ½ in. size, can usefully be used in mould driers and small heating units, where it is more efficient than the class of material known as gas-works char, giving more heat and less ash.

The material from roofs and cupola dust catchers, as would be expected, contains coke, limestone and iron, and probably sand or slag. This material, if left any length of time, rusts together into a hard cake which, to say the least, is difficult to remove from roofs.

The percentage composition of this material is:—

	Per cent.
Metallic iron	35.11
Silica	35.28
Iron oxide and alumina	45.54
Lime	.30
Loss on ignition (coke and CO_2) ..	11.75

The quantity of this material produced annually must be quite considerable, and it is suggested that if placed aside to weather it would gradually form a miniature ore bed which in time would be worth lifting. The usual tendency to scatter it throughout other foundry refuse makes it quite worthless. The usual figure of 5 per cent. loss in melting in the cupola must represent a very large tonnage annually in this country, and any definite reduction would relieve the heavy demands on the imported raw materials.

Slag Losses

Slag.—With slag-skimming practice on a continuous running system the loss of metallic iron is nil, and the percentage of iron combined in the slag as a silicate of iron should be kept at a minimum figure by regular daily analysis. The possible application of slag by its reuse does not seem very promising. The percentage of iron may warrant smelting at some future date. In poor cupola practice, no doubt the high percentage of metallic and combined iron will justify this, but where it is kept below 6 per cent., this is out of the question at present.

If graded or granulated, it can be used successfully for making concrete, but will not be able to compete with whinstone from a conveniently situated quarry. Another application of slag is the making of slag wool. The author has always maintained that the old steel-making axiom, "if the slag is right the metal is right," applies more or less to the cupola also. Using ample limestone (the average practice invariably uses too little) and generous addition of fused soda ash, a very fluid basic slag is produced.

This can be collected in a ladle and poured at relatively long intervals in a selected spot. Slag in this condition can readily be converted into slag wool by a simple jet of compressed air. A makeshift demonstration can readily be arranged.

This material must have many applications, such as all forms of insulation, for example, houses, refrigerators, shipping and vehicles operating in low-temperature atmospheres. It should also be suitable for weaving cloth or sacking and heavy mats for various purposes, such as temporary coverings, etc., in military field operation, owing to its permanence in damp conditions which usually rot all sorts of vegetable fibres. The 45-in. cupola, melting for 2 hrs. daily, should produce several hundredweights of this slag wool, which can be sorted, if necessary, at the factory where it is finally used.

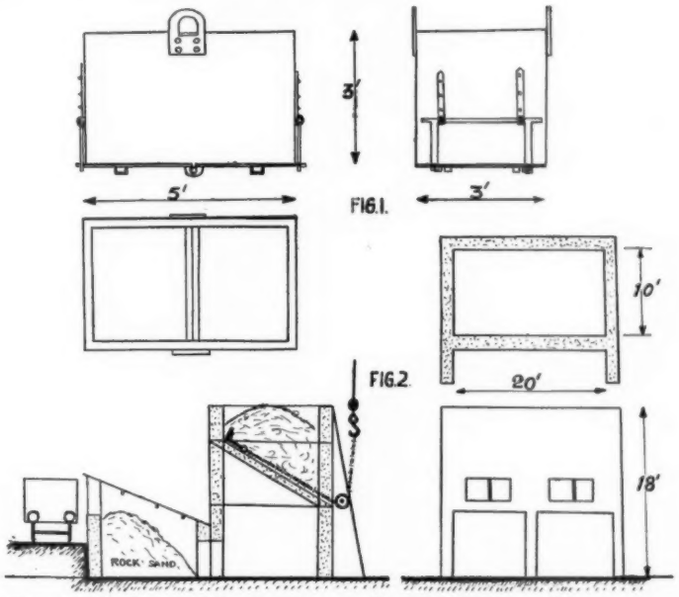


FIG. 1.—DESIGN OF BOX SHOWING THE BOTTOM HINGED IN HALVES FOR RELEASING THE MATERIAL.

FIG. 2.—GENERAL ARRANGEMENT OF THE ELEVATED REFUSE BIN AND THE SIMPLIFIED METHOD OF EMPTYING RAPIDLY.

Firebricks.—Refuse firebricks may be used for concrete or ground and graded for core vent filling, and in some cases wet ground to form loam for special applications.

Sand Plant

Metal from Oversize Delivery.—The material from the oversized delivery of the sand-treatment plant consists of lumps of dry sand and cores mixed with cast iron and steel material in the form of sprigs, wires, fins, etc. Before remelting, this material is best treated magnetically to separate the metal, and there are various forms of machines incorporating magnetic pulleys and similar devices.

An attempt was made to adapt the sand plant temporarily to deal with accumulated oversize material by putting it through the sand plant in such a way as to miss the rotary screen and fall direct on to the rubber band conveyor going round the magnetic pulley. The magnetic material was then deflected from the pulley on to the floor and removed for remelting.

This arrangement dealt with materials at the rate of several tons per hour, but, owing to the position of this magnetic pulley in a rather con-

* Paper read before the Scottish Branch of the Institute of British Foundrymen, Mr. Mortimer presiding.

Salvage of Foundry Waste

fined space, and due to the wear and tear on the rubber band, the practice was discontinued and a separate magnetic pulley separator installed. This is fed from an overhead hopper and handles easily all the available oversize material from the sand plant. The magnet should be placed before the oversize riddle.

Silt.—This material appears to have roughly the same composition as moulding sand, that is, the same percentages of clay and sand except that this is of a much finer grain size. There does not seem to be any moulding application except remixing in milled sand to control permeability and give a closer mould surface.

Small Metal from Sand.—The small metal from moulding sand passing ¼-in. riddle varies only in size from that recovered from the oversized material, and can be remelted in the same way.

Dressing

Core Sand and Moulding Sand.—The accumulation of material in the dressing shop contains large quantities of moulding sand more or less diluted with burnt oil-sand and this is returned to the sand plant for rebonding. The success of this may be limited in some ways, but mainly by the fact that, if less material is removed than that which is brought in, in the way of new oil-sand, the floor level begins to grow to a troublesome height.

Unburnt oil-sand or burnt oil-sand, which can be separated, may be reclaimed by suitable milling and sieving. This reclaimed material can be used up to 50 per cent. without trouble, and probably nearly 100 per cent. with care. The saving here is twofold: reduction in cost of new sand and reduction in cartage of refuse. The author has a small mill in operation which grinds and sieves old cores, but this design requires some further improvement, since it grinds very much faster than it sieves.

Core Sand and Moulding Sand.—The excellent Paper* by Mr. F. Hudson, "The Reclamation of Oil-Sand Cores," gives this particular field very careful consideration. It begins with a number of considered opinions of well-known men in the American industry on the subject, and the perusal of this confirms the general attitude here, namely, that there is often little to encourage expensive equipment installations in many cases where new sand is cheap, the quantity used is low, the work lends itself to dry sand or even green sand, and the disposal problem does not exist.

In the present author's experience this sand recovery has by change of incidental expenses become alternately an economical proposition, then uneconomical, then economical again. Many of the American authorities quoted in Hudson's Paper state that the recovery of oil-sand for making cores is not a practical proposition, although a few state that the recovered sand can be rebonded for moulding sand. The proposition of the problem is still the same at the present time, and its solution is the same also.

Several recovery methods are mentioned by Hudson, but the most popular seems to be the preliminary grinding and then sieving on screen about, say, 80 mesh, with, of course, a magneting operation as required. The sand so recovered from cast-iron castings is coated with a carbonaceous or oil deposit, according to the extent of burning of the core oil during baking, and this is shown to have a considerable effect on the gas generated in the core during casting the second time. It is evidently not considered economical to remove the coating by washing or rumbling.

The necessity for keeping this aspect in mind is obvious, but the economic aspect of the question makes it necessary to seek the simplest process. If recovered oil-sand be stored in the open it tends to disintegrate by the action of rain, but a well-baked oil-sand softens at a surprisingly slow rate, and having once soaked up water the subsequent sieving action is very difficult.

The present author's method is to employ one labourer collecting used oil-sand in a shed outside the foundry. The machine used is a type of pan mill. The cores are broken with a light plying hammer and thrown in the mill, from which only material less than ¼ in. mesh is delivered in a continuous stream.

The same operator removes the sieved sand to the Rotoil remixing plant. While the presence of the gas-forming material in the recovered sand is admitted, nevertheless this sand is regularly used by the author with 50 per cent. new sand, and only at 100 per cent. old sand did the cores scab or blow to a serious extent.

Core Wires, Grids, Small Iron Sprigs.—These may be made of special shapes, and should be recovered for re-use where possible. It is possible to straighten these for at least a few times, but after the steel has been subjected to

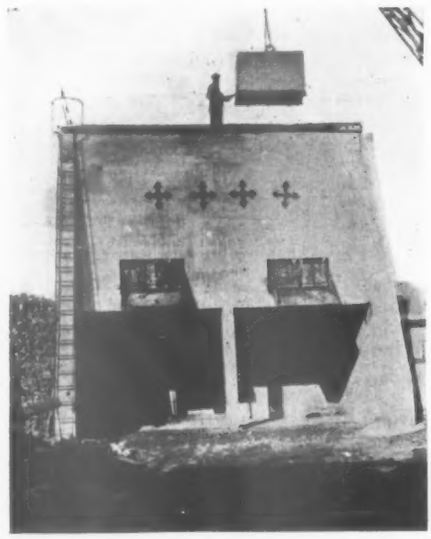


FIG. 3.—BOX OF GRANULATED SLAG BEING DUMPED INTO THE HOPPER.

the heat of casting often enough it becomes crystalline and brittle. There is at least one machine for straightening wires on the market. The grids, fins, and small iron will find its way into the sand plant and be dealt with there. There has evidently been no attempt to design a machine to straighten and clean sprigs.

Dust from Grinders, etc.—The dust-extraction plant serving the grinders, rumbling barrels, and airless shot-blast machines collects a fair quantity of material which contains a considerable percentage of iron, as shown by the following analysis:—

	Per cent.
Metallic iron	44.69
Silica	30.43
Iron oxide; alumina	69.04
Lime	nil
Loss on ignition	nil

This material may have some use in its original form, as, for example, in the making of exothermic powders for oxidation reactions, but, if not, it can be weathered into lumps in the open, when it should form a fairly good ore at some future date, provided that it is allowed to collect to a reasonable quantity, thus making it worth while arranging for its removal.

Drying Plant

The ashes or clinker from stoves and mould driers, if of the hard, clean type, can, of course, be used in ash beds, core vent, etc., so long as unburnt coal is carefully excluded. Unburnt coal, such as anthracite used in forced-draft fires, finds its way into sand and causes small gas holes at the mould face.

Where coal is used for drying ladles, a great deal of the coal is not burnt at all, and at the same time the bulk of the heat is lost. This coal, if unburnt, does not find a ready application, as it is often at present of a very inferior quality and becomes solely a disposal problem. Specially-constructed coke driers or oil burners with forced draft would dry the ladle much more satisfactorily and eliminate the disposal of ash.

Moulding

Where cast-iron hangers and grids are used, a considerable amount of work is necessary for making the daily requirements, as a large flat top part may use up scores, which, on the knock-out operation, are broken off. Then, again, if a short straight iron is required, there is a tendency to lift the nearest hanger and break it down to the required size. The recovery of cast-iron hangers for re-use is therefore rather poor.

As an alternative, mild steel has been used for these articles. There is, then, no need to wait for a supply of liquid cast iron to cast the required sizes. Further, the mild-steel hanger cannot be broken, and is therefore available for re-use a great number of times. The knock-out time in the case of a large top-part reinforced with mild-steel hangers is considerably increased, and this point should be borne in mind when considering whether it is worth while or not in ordinary times when materials are not restricted to the same extent as at present.

Final Disposal of Refuse

The author cannot recall ever having heard this subject discussed at any of the Institute meetings, but it is nevertheless a matter which cannot be ignored. In large or medium-sized foundries it may well amount to an important annual cost. In general, the refuse is a mixture of small and lumpy material which requires a flat surface from which to shovel. When tipped from barrows, it seldom rises above 2 ft. high, and thus takes up a considerable ground space. If a raised plank is used to run the barrow up to any height greater than 2 ft., a long flat run must be used, or the going is very heavy.

The mixed material then packs more heavily and makes shovelling more difficult still. It is common to have to loosen the material with a heavy pick before shovelling. Really good carters can shovel upwards into a cart or lorry, but, unless they are really good (and they very often are not), the work becomes tedious, and the periods of rest are apt to exceed the periods of active work. When outside men are employed continuously on this job, their work becomes gradually less enthusiastic, especially if employed at an hourly rate.

Cupola slag, if caught up in lumps from the floor and dumped from a barrow, is heavy, hard, ragged and awkward to handle, and, when mixed or buried in moulding sand, is very difficult to remove.

Many small foundries have a working arrangement to have rubbish removed by horse and cart at a fixed rate per ton. This method works very well so long as the carter comes to the foundry when required. However, this method may be too slow, and a self-tipping motor lorry is the next substitute. These can be hired with a driver at rates about 8s. per hr., but this rate will no doubt vary according to local supply and demand.

Flat or fixed trucks are unsuitable, as the refuse has to be shovelled off at the dumping point. By carefully placing the truck with relation to the heap it is possible to put several men to work filling by shovel, but unless the lorry can be so placed that it is surrounded on

* Foundry Trade Journal July 24, 1930.

Salvage of Foundry Waste

three sides by the waste material, not more than three men can work without getting in each other's way. Then when the lorry is on the way to the dumps the additional men are idle, and in the end it does not work out much better than carting.

Some people claim that carting is actually cheaper. Where motor vehicles are hired by the hour some supervision is necessary, or the nature of the work will bring about a diminishing work speed which makes removal very costly. Personal experience verifies this. In working on this refuse men show a tendency to move about selecting light unbonded material such as riddle ashes, sharp sand and the like, and often avoiding accumulations of slag.

It was felt that although the mixed nature of the material caused much of the difficulty, *i.e.*, in driving the shovel into the heap, the main cause of the tiring work was the lifting of this material to a height of some 5 ft. from the ground. Thus the best way to get at the solution of the problem seemed to be to arrange for the elevation of the material into an overhead hopper.

Overhead Hopper for Refuse Disposal

The author can only recall seeing one illustration of such a scheme in published literature, and as far as he can remember it consisted of a circular water tank on four legs or pillars a considerable height above the ground. The rubbish hopper had been built into this framework under the water tank. After due consideration a simple rectangular form, such as is shown in Figs. 1 to 3, was decided on.

This gave a useful loading capacity of 20 ft. by 10 ft. and average depth of 7 ft. The clearance under the hopper was about 8 ft. This was estimated to hold at most 80 tons, *i.e.*, well-filled and tightly packed. The site selected was under the span of a 7-ton jib crane having a lift height of nearly 40 ft., and the hopper stood astride a small gauge railway without materially altering the storage space of the yard.

The idea was to fill a box or bucket and lift this several times per day and dump the contents into the hopper. The main preoccupation at the start of the job was to make sure that the structure was reliable, to the extent of withstanding a possible bump with the box loaded with three tons of material.

An all-metal design of hopper was considered and turned down because of the lack of rigidity, possibility of rapid weakening by corrosion, and the difficulty of getting steel and an all-concrete design decided on. The walls were made 15 in. at the bottom and 12 in. at the top, set on good foundations and well-reinforced with expanded metal. The bottom consisted of scrap 90-lb. rails, set 2 ft. apart, covered with expanded metal and enclosed in 7 in. of concrete. The main girder was enclosed in concrete, and the finished hopper has no structural steel exposed. A self-emptying hopper for this mixed material would require a slope in the bottom of about 68 degrees, which would reduce the capacity to negligible proportions.

As a compromise between ease of emptying and maximum capacity an angle of about 31 degrees was adopted. With this angle a considerable quantity runs freely at first, and then the remainder must be eased down by one method or another.

Various types of shovel, rake and bar were tried with moderate success and a certain amount of physical effort, and by these makeshift means a rate of loading varying from, say, 10 tons per hr. to 3 tons per hr. per man were obtained. After considering all the variation of the common shovel and rake so as to draw downwards from a low position outside, or from a higher position in the hopper itself and pushing downwards from various positions, it was thought that this might be improved by eliminating the physical effort further.

A rubber travelling belt in the bottom would, of course, supply a steady feed, but this is out of the question, and the simplest method seems to be an adaptation of the rig usually used in the cupola for dragging out the incandescent bed after dropping the bottom. All that is required is a wire rope or chain laid along the bottom of the hopper with a suitable cross bar attached to the end furthest from the discharging opening, and a well-anchored guide pulley placed just outside the opening round which the rope runs to the crane hook.

This method of hopper loading is now working very satisfactorily. A fortnight's accumulation of refuse material can be loaded and dumped in several hours. The material is out of the way, and the manual handling problem has disappeared. A radical reduction in the cost of removal per ton has resulted, and the material is available at any time which may suit the contractor.

If a larger output of material be available, the capacity of the hopper can be increased (provision has been made in this case to increase the height), or the removal contractor would have to come to the foundry oftener than, say, once per fortnight. If a truck be available inside the works, the hopper might even be dispensed with altogether. It is assumed that one would make the best of the circumstances of his own particular case in dealing with a similar problem elsewhere.

Slag from Cupola

There is usually insufficient slag produced in the cupola to warrant the installation of special plant to deal with it. Low slag volume used to be the rule rather than the exception, and no doubt this largely accounted for the universally rapid wear on cupola linings, and probably had a bad effect on the metal produced. Assuming a normal slag volume as required by good melting conditions, the question of disposal again enters.

The usual type of cupola, with the slag hole to the rear, *i.e.*, opposite the tap hole, and the slag and air blowing out alternately, gives at least one man a considerable amount of heavy work, as hot slag on the ground can only be handled with a hook and then laboriously removed in lumps to the dumping point, most of the work being carried out under a shower of sparks. The use of the slag-skimmer continuous tapping spout delivers the slag in a thin fluid stream free from sluttering, and this can readily be collected in a ladle or, in the case of small furnaces, in a barrow lined with moulding sand.

If a ladle of the type shown earlier is used, the slag can be poured out on the ground. The labourer is subjected to excessive heat, and may on occasion find it necessary to abandon the slag bogie, leaving it to its own devices in the middle of the operation.

The author once saw a lead-melting furnace which delivered slag either intermittently or continuously. The slag ran down a launder or runner, where it was suddenly picked up by a strong jet of water and shot into a sump. A small chain bucket elevator worked continuously from this sump, delivering to an overhead hopper the cold slag. What appealed to the author most was the fact that the slag was instantly converted from an unmanageable material at high temperature to a uniformly granulated condition ideal for handling.

Although this is the most efficient and strikingly successful method, as already stated, its application to a cupola running only a few hours per day and not even slagging all the time, is out of the question.

For several years it has been personal practice to pour this slag into a shallow depression in the foundry yard, using water sprays for cooling the slag and prevent glare in the black-out, and this place had to be cleaned out by shovelling before each cast. Another method tried was to dig a hole about 6 ft. long, 2 ft. deep and 3 ft. wide, with sloping sides. A drawback frame with two heavy lifters was placed in the hole and the slag cast into this until full.

Several holes of this type could be used as convenient, and, using a 7-ton crane, the heavy block was hoisted above the motor lorry and broken with heavy hammers. The method got rid of the slag satisfactorily, but it was apt to fall in very large pieces into the lorry, and after several days these were often hot enough to burn the woodwork. The lorry drivers were inclined to avoid this job, and the scheme was abandoned.

This scheme does work, however, in steelworks, for example, where slag of the tap cinder is loaded in trucks for sale to blast furnaces. Then the present disposal scheme was considered. It was decided to fill up one of the concrete sumps with water so that the slag could be poured into the steel bucket. If the depth of water is, say, 2 ft. 6 in. or more, the degree of granulation is remarkable, and the amount of heat radiated is practically nil. The water boils, of course, but this results in nothing more spectacular than a cloud of steam. A bucket of the size described will deal with over a ton of slag without emptying, but the granulation is, of course, more efficient in the early stages.

There is no need to use excessive quantities of water in this process, and after due consideration it was deemed unnecessary to put in a drain to run off the water. The water supply is actually taken from the overflow from the water-cooling system of the air compressors. Thus the water run into this cooling system regularly to bring down the temperature displaces its equivalent to the slag pit, where it performs further useful service. The granulated slag is then hoisted above the hopper and dumped where it is found to flow readily even on the 30-deg. floor angle.

Cast Iron and Steel Borings

The author has dealt with the melting of cast iron and steel borings in the cupola at length elsewhere, and it may be unnecessary to go into great detail now. The melting of cast-iron borings in the loose form independent of their size has been carried out by the author for the past four years. The cost price of these borings is 25s. per ton for cast iron and 40s. per ton for steel. The tonnage melted, including other small iron from the dressing shop, is about 80 tons per month and often over 100 tons, and this remelted metal replaces normal material, such as pig-iron and scrap.

The method is relatively simple, and the essential points are:—(1) A low blast-pressure is used, *i.e.*, just sufficient to bring the flame through the charges freely; (2) a heavy slag volume is used, which if basic, will keep down the sulphur, and (3) a low stock line. Conditions one and three are to some extent dependent on one another, as the higher the stock line the more resistance to the blast. It is a question whether a blower or a fan would be more suitable, but if a cupola were constructed specially for melting loose borings the furnace shafts should be reduced very considerably in height, or at any rate the charging door placed lower.

The cupola used by the author is a 32-in. balanced blast furnace fitted with a self-slagging runner, and the metal is collected in 10-cwt. ladles. From this it goes to the casting point. This metal has been used for castings, and on test has given high tensile test results owing to the low carbon possible. It may also be cast in the chill moulds and slacked for remelting. Many attempts to use steel turnings in the loose form were made in this cupola, but results, although metallurgically successful, were not worth the trouble.

A combined casting process was developed in which the steel turnings form the chilling

(*Concluded on page* 350.)

A High-Strength Aluminium Sand Casting Alloy not requiring Solution Treatment and Quench*

Since the use of high-strength aluminium sand casting alloys was instituted, difficulty has been experienced from time to time due to the high-temperature solution treatment and quench necessary to attain the high physical properties. Warping and cracking due to the high stresses introduced by drastic quenching from the neighbourhood of 530 deg. C. have not been uncommon, especially where the casting design included long, thin sections or rapid changes in section. Production delays were also frequently encountered due to the following reasons—

(1) Actual length of time required for solution and precipitation treatment,

(2) Difficulty of fitting solution and precipitation treatment of castings into a foundry production schedule with long waiting lists due to the heavy demands on production capacity of installed high-temperature heat-treating equipment, and

(3) Scarcity of high-temperature heat-treating equipment large enough to handle castings more than about 3 ft. in any direction.

The recent increase in production due to the Defence Programme has served to magnify these latter difficulties attendant with the use of the solution-treated, quenched and aged type of high-strength aluminium sand casting alloy. The need for an aluminium sand casting alloy which has physical, chemical and foundry properties comparable with those of the high-strength alloys, but obtainable without the use of a high-temperature solution treatment and quench has been very apparent.

An aluminium-zinc-magnesium alloy has been used as a general purpose sand casting alloy for several years, and recent development work has shown that an alloy with a similar composition satisfied the need stated above. This alloy which is proposed for inclusion as alloy "O" in the A.S.T.M. Tentative Specifications for Aluminium-Base Alloy Sand Castings (B 26—37 T) has the following composition:—

Zn, per cent.	4.80 to 5.70
Cr, per cent.	0.40 to 0.60
Mg, per cent.	0.40 to 0.60
Ti, per cent.	0.10 to 0.25
Fe, max., per cent.	1.00
Cu, max., per cent.	0.20
Si, max., per cent.	0.60
Other impurities, max., per cent.	0.05 each
Al, per cent.	Balance.

The physical properties which have been established as guaranteed specification values for this alloy are as follow:—

	As-cast (*a*) (unaged) (*b*)	Artificially aged (no quench)(*c*)
Tensile strength, min., tons per square inch	13.0	13.4
Yield strength (0.2 per cent. offset), tons per square inch—		
Min.	—	9.8
Typical	7.2	11.2
Elongation in 2 in., min., per cent.	6	3

(*a*) The properties are the same as those specified for alloy G, heat treatment No. 1, in A.S.T.M. Specifications B 26-37 T, and are better than alloy M, heat treatment No. 1.

(*b*) This condition will prevail for two to three weeks after casting. It is only temporary, as indicated in the description of the properties of this alloy.

(*c*) The properties are the same as those specified for alloy G, heat treatment No. 2, and alloy M, heat treatment No. 2, A.S.T.M. Specifications B 26-37 T with somewhat higher yield strength.

* An appendix to the Report of Committee B7, submitted to the Annual Meeting of the American Society for Testing Materials.

In this condition the proposed alloy meets in tensile strength, elongation and yield strength the requirements prescribed for alloy G, heat-treatment No. 2, Specifications B 26—37 T, and exceeds those of alloy M, heat-treatment No. 2. The high elongation of the proposed alloy in the unaged condition during the first two or three weeks after casting will be useful primarily where cold-deformation, straightening, etc., of castings are necessary. However, even without artificial ageing the properties of the alloy will gradually—within three to six months—approach the properties of the same casting after artificial ageing and lose a great deal of the original ductility just like alloy T-4, heat-treatment No. 1 when it changes—through air ageing—into the aged condition alloy T-6, heat-treatment No. 2. The properties of the artificially aged material are those to be counted on in service and, therefore, all design should be based on artificially aged material.

Artificial ageing not only stabilises the physical properties but also serves as a strain relief and permits close tolerance machining within a few days after casting without the danger of subsequent warping or distortion.

In Table I are shown some typical test data obtained on room temperature aged and artificially aged bars of the proposed composition. The stress-strain data were taken with Templin automatic recorders of high sensitivity.

TABLE I.—*Typical Test Data for Alloy O.*

	Tensile strength, tons per square inch.		Yield strength (offset 0.2 per cent.), tons per square inch	Elongation in 2 in., per cent.
Air Ageing only. (Averages of Four Tests).				
10 days ..	13.7	13.7	7.9	8.9
60 days ..	14.3	14.3	9.6	5.7
120 days ..	16.0	16.0	11.5	4.7
After the Artificial Ageing Treatment.				
Individual test bars picked at random—	13.8	13.8	11.3	4.5
	13.8	13.8	11.3	4.45
	13.7	13.7	11.5	4.4
	13.8	13.8	11.6	4.4
	14.5	14.5	10.8	3.9
	14.4	14.4	11.7	4.6
	14.5	14.5	12.3	3.5
	14.3	14.4	12.4	3.2

Corrosion tests run by various agencies like the Navy Department, General Electric Company, etc., indicate that the corrosion resistance of the proposed alloy is better than that of alloy G, heat-treatment No. 2 of Specifications B 26—37 T, although perhaps not quite so good as the silicon-bearing alloys like alloy M, heat-treatment No. 2 of Specifications B 26—37 T.

The foundry properties are comparable to A.S.T.M. alloy G, but not quite so good as A.S.T.M. alloy M.

X-ray pictures taken on quite complicated castings have demonstrated remarkable soundness of the section at critical points. The machinability is excellent, far superior to either alloy G, heat-treatment No. 2, and alloy M, heat-treatment No. 2 and probably even better than the standard A.S.T.M. alloy G.

The proposed alloy lends itself very well to anodisation with a good white colour and high corrosion resistance. Upward of 100 tons of

(*Continued in next column.*)

Electrolytic Manganese

A CANADIAN PROCESS DEVELOPED

A cyclic process for the extraction of manganese from its ores and the recovery, through electro-deposition, of substantially pure metallic manganese has been patented by the Consolidated Mining & Smelting Company of Canada, Limited.

The process is characterised in that a separately cycling manganous-sulphate ammonium-sulphate electrolyte, having a *p*H value within the range of from *p*H 4 to *p*H 8, is subjected to electrolysis in the cathode compartment of a diaphragm-type electrolytic cell, while a sulphuric acid electrolyte is maintained in the anode compartment of the cell by the addition thereto of predetermined quantities of water to combine with the migrating sulphate ions. The process includes the steps of separately withdrawing depleted electrolyte solution from the cathode compartment of the cell, replenishing the manganese content thereof by the addition of substantially pure manganous sulphate, returning the replenished solution to the cathode compartment and separately withdrawing sulphuric acid solution from the anode compartment.

One of the principal features of the invention resides in the manner in which a separately cycling electrolyte, formed of a solution of manganous sulphate and ammonium sulphate, is continuously electrolysed in the cathode compartment of an electrolyte cell, while maintaining, in the anode compartment, an entirely different electrolyte consisting substantially of a sulphuric acid solution. The two compartments are separated from each other by means of a porous diaphragm; the anolyte and the catholyte do not intermix except to the extent to which there is a transfer of ions through the diaphragm during electrolysis and to the extent to which sulphuric acid enters the catholyte from the anolyte as the result of diffusion. The additions to the anolyte and catholyte, necessary to maintain the electrolysis, are made separately, and each electrolyte is separately discharged from its respective compartment.

Further features reside in the manner in which the solution from the leaching step of the process is continuously purified and treated to yield hydrated manganous sulphate crystals in a highly purified form and also in the manner in which the purified crystals so obtained are used to replenish the spent catholyte. By the addition of the hydrated manganous sulphate crystals to the depleted catholyte, a solution is formed which is suitable for returning to the cathode compartment as feed solution.

(*Concluded from previous column.*)

good castings of this alloy have been made during the past year with very satisfactory results.

As to the consumers' demands, this is a matter of speculation; however, at a meeting held in New York City some time ago with representatives of the Bell Telephone Laboratories, Sperry Gyroscope, Eclipse Aviation, American Can Company, Ford Instrument, and General Electric Company, it was the consensus of opinion that an alloy with the properties of the proposed composition, which would not require high-temperature solution treatment and quench to develop the properties, fills a very definite need and would find considerable use if once standardised. Since that meeting in New York, the Eastman Kodak Company and the Parker Appliance Company have, of their own volition, asked to have their endorsement of and their desire to have this alloy standardised added to those who attended the meeting.

British Cast Iron Research Association

ANNUAL GENERAL MEETING

NEW PREMISES—FINANCIAL NEEDS—POST-WAR COMPETITION AND THE FUTURE OF THE CASTING INDUSTRY—ELECTION OF NEW PRESIDENT AND OTHER OFFICERS

The Annual General Meeting of the British Cast Iron Research Association was held in Birmingham on November 12. On account of the prevailing conditions, it was not practicable to hold the usual annual luncheon, but the meeting was preceded by a gathering of members of Council at luncheon, at which the Chairman of Council, Dr. H. Hartley, presided, accompanied by the President-Elect, Mr. P. Pritchard, and Prof. Sir Lawrence Bragg, F.R.S.

Acquisition of New Premises

Following the luncheon, DR. H. HARTLEY said the principal object in view in arranging for this luncheon was to take an opportunity of telling the members of the Council what had been done in the acquiring of new premises for the Association. The Association was the link between the pure scientist on the one hand, and the industrialist on the other, and under present conditions it should be even more useful to the industry than ever before. A year ago members were all very concerned as to the possibility of damage to the laboratories in St. Paul's Square, with resultant loss of apparatus and consequent impairment of the work of the Association. The need to seek a new headquarters was evident.

A number of buildings were viewed, and it was unanimously decided by the members of the Executive Committee that the Hall which has been acquired would be eminently suitable as a new home for the Association. An effort was made to secure premises which could be rented, but this was not possible and the need to purchase had to be faced. On June 20 a meeting of the Council was called to outline the recommendations of the Executive Committee. A special request had been made to members to use every endeavour to attend, and it was to be regretted that the meeting was relatively a small one. Those present unanimously endorsed the recommendation of the Executive, and steps were taken to acquire the new headquarters.

Financial Aspect

Some few years ago, during the Presidency of Lord Dudley, a special appeal was made to members to increase their contributions for general research purposes. It was indicated that this Association wished to accumulate a reserve which could be used to secure not only additional plant for the laboratories, but also for new buildings. From the current balance-sheet it will be seen that the Association has been able, to date, to reserve a sum of £7,500 for this purpose. The Council felt a very real sense of indebtedness to those who had helped with these additional contributions.

The purchase price of the new property was £9,850. It is estimated it would cost us between £3,000 and £5,000 to transfer the plant and equip the building. The first concern was to get the sum of £9,850, and it was at this point that Mr. Percy Pritchard so generously helped. With the agreement of his colleagues, he had lent to the Association the sum necessary to enable the Association to secure the new buildings. Further, he had indicated that if the Association were able to obtain additional subscriptions from its members to enable it to repay that loan within twelve months, no interest would be charged on the money for that period. If the Association found itself unable to take advantage of this further very generous offer, then it would pay interest at the rate of 4½ per cent. on the borrowed moneys, or on any outstanding sum, until the debt was wiped out.

After careful consideration, the Executive Committee has decided that the Association must accumulate a further £15,000 to enable it not only to clear off this debt, and effect the removal of the equipment, but also to secure the additional plant which the staff required for the better execution of their work. An Appeals Committee had been formed, which would operate under the Chairmanship of Mr. Arnold Pearce; the other members were the Director, Mr. J. G. Pearce, and the speaker. The principal work of raising money would, however, fall on the shoulders of his two colleagues.

More Finance Needed

This committee had it in mind to act in two ways: First, it could make a further drive to secure new members, and in this effort he was sure it would have the goodwill of the ironfounding industry. Secondly, it would ask present members to increase their subscriptions over a period of two or three years. If this could be done, the Association would be able to avail itself to the full of the help offered by the D.S.I.R.

This year the Association needs an additional £3,000 to £5,000 in subscriptions; if this was attained, the Association would receive £ for £ grant from the D.S.I.R. He asked each member of the Council to make up his mind how he could best help to raise this money. He did not wish to upset any arrangements which Mr. Arnold Pearce might have in view, but he would like him to consider the desirability of asking each member of the Council to make himself responsible for obtaining, say, a double subscription from each of a given number of members for the required period.

The Council had made a wise choice of premises. This was the view also of the representatives of the D.S.I.R. who visited Birmingham in August last. The Director and the speaker took them over the new building and explained something of their intentions in regard to its utilisation. They felt the Association had been extremely fortunate to secure such premises.

In conclusion, he reiterated that it would not have been possible for the Committee to present such a favourable report had it not been for the generosity of Mr. Percy Pritchard. The President-Elect then asked Mr. Pritchard to address the members.

A Long-Range Policy

MR. P. PRITCHARD said Dr. Hartley had referred in generous terms to what he had been able to do in this matter, and he had been pleased to do it for an industry with which he was so closely associated. When he first saw these premises he formed the opinion that they would meet the Association's requirements admirably and would make the Association envied by kindred associations, but he wanted to make it clear that while he had been able to provide the opportunity, it was up to members to enable the Association to take full advantage of it.

The Association rightly and properly was practically fully engaged on behalf of the industry in furthering the war effort, but it was equally right and proper to consider what was likely to happen after the war. He suggested that in seeking a place to which to disperse which was worthy of being a permanent home, the members were showing a desirable confidence in the future. His interests were originally, and were still mainly, in the field of the cast metals and in his opinion there was ample room for confidence in the future of the cast form and the scope for progress therein was greater than in the case of the wrought metals. The cast form had never had the consideration due to it, through the unquestioning way in which the foundry industry had allowed the wrought product to be accepted by engineers as the only one worth consideration. The advantages of the cast form over the wrought form in initial cost, speed of production and economy in fabrication were obvious. Its main drawback was that it is not at present completely reliable with respect to soundness. What foundrymen had to strive for, and only through systematic, scientific attack could they achieve it, was a cast product with the highest qualities within itself, suited for its intended purpose, uniform and regular in character, sound throughout and involving a minimum of subsequent treatment, machining or finishing, although that finishing has also to be first class of its kind. The casting of metal must cease to be something which in the minds of engineers was the first step to a refining operation; the casting can and would become not merely a means to an end, but an end in itself.

Post-War Competition

Everybody had heard about the way in which the ironfounding industry was to have competition after the war from other materials, such as light alloys of various kinds and plastics. It doubtless would, but it was problematic whether this scheme showed any evidence of lying down and letting the ironfounding industry decay. The chairman of the Council sometimes said that the finest thing that ever happened to the gas industry was the competition from the electrical industry. Someday ironfoundries might be prepared to say that the finest thing that ever happened to cast iron was the advent of the light alloys and plastics. Whether one considered the competitive position of cast irons against these materials, or of cast metals in general against wrought metals, the answer was the same. The industry required first-class scientific and technical development, first-class management and organisation in foundries and first-class education for the various grades of men, both operative and technical, in the industry. The true enemies of the future of cast iron were complacency and ignorance within the industry. Foundrymen could not afford to neglect what other industries, food production, agriculture, welding, etc., found essential to their business growth.

The new premises should give ample room for future expansion, and he suggested that their acquisition provided the industry with a great opportunity to satisfy the need for an independent national centre for the development of the materials in which it was interested and which covered not only the range of cast irons itself, but the raw materials used in the product and used up in the course of manufacture, together with the plant and equipment used in the industry itself. It should enable the industry to take full advantage of developments in other industries and prevent competitive materials taking toll at its expense. It was a project which commended the full support of the whole industry—founders, suppliers of material, makers of equipment and users. Speaking as one who manufactured many branded products, some originated by his firm, he was firmly convinced of the need for a central and independent body which could take a course uninfluenced by the persuasive arguments of the salesman or the metallurgical fashion of the moment.

B.C.I.R.A. Annual Meeting

Yardstick of Progress

The progress of the industry might be judged by the recent adoption by the B.S.I. of a national specification calling for tensile strengths up to 26 tons per sq. in., although he did not wish to suggest or to imply to engineers that tensile strength alone was a proper criterion for the strength of a casting. Material was in regular production, giving on a standard 1.2-in. bar a tensile strength of 33 to 36 tons per sq. in., with correspondingly high transverse strengths, and a deflection at 18-in. centres of 0.3 to 0.45 in., smaller bars showing correspondingly higher figures. The industry was, however, concerned with many things besides strength, such as soundness, uniformity, economical manufacture, and mistake-proof production. It was better to have sound castings in average quality material than unsound castings in higher strength material. Foundrymen were more concerned with castability than with strength.

He trusted that the provision of this permanent home for the Association might lead to the closer knitting together of the various interests in the industry, and hoped that, when the building was occupied, the Council would arrange for a formal opening ceremony, so that members and others interested might have an opportunity of seeing the place and satisfying themselves that this was the right course to take.

DR. H. HARTLEY, inviting Prof. Sir Lawrence Bragg, F.R.S., to speak, said that Sir Lawrence, who had succeeded the late Lord Rutherford at the Cavendish Laboratory, Cambridge, probably the most famous school of physics in the world, represented the Department of Scientific and Industrial Research on the Council, and the Council were delighted to have him with them.

Life Blood of Industry

PROF. SIR LAWRENCE BRAGG, F.R.S., said he was glad to be present as representing the Department of Scientific and Industrial Research, as he had the warmest admiration and respect for what his industrial colleagues were doing. Industrial scientists sometimes thought that university scientists were rather snobbish, but the latter type was a myth. The scientists he knew had a feeling of humility when they went round works and considered the facts known in them. His pleasantest associations arose out of such contacts. He said that research was to industry like the supra-renal gland to the body; if the gland were cut out, the body died. There were stirrings of a new type of fundamental knowledge in the study of structure, incipient phase formation and internal stress. Industry really had not realised the change of aspect, and it had not gone into it as wholeheartedly as America and Germany. He was glad to come, because it was a joint problem and fundamentally a long-range problem.

DR. H. HARTLEY, in thanking Sir Lawrence, said that the metallurgical scientist lived on capital, the university scientists providing the capital.

ANNUAL GENERAL MEETING

The meeting of the Council was followed by the Annual General Meeting, over which Dr. H. Hartley, chairman of the Council, presided at the outset. MR. J. G. PEARCE (Director and Secretary) announced apologies from many members who were unable to attend owing to war conditions. The approval and adoption of the Twentieth Annual Report and the accounts was formally moved by the chairman, seconded by Mr. P. H. Wilson, and carried.

Election of President

Proposing the election of MR. P. PRITCHARD, M.I.A.E., F.R.Ae.S. (Midland Motor Cylinder Company, Limited) as President of the Association, DR. HARTLEY recalled that at the luncheon he referred to him as something more than an industrialist. He was, in fact, a no mean technician. In recent years Mr. Pritchard had done a great deal of work in connection with light alloys. He held an honoured position in industry, and they felt that in asking him to accept that honour they would not have as President a man who would be a mere figurehead. During the past year Mr. Pritchard had done a great deal for the Association, and he hoped the members would realise the great debt they owed him. When the scheme to raise additional money for the purpose of finding a new and permanent home for the Association was first mooted, some of them perhaps pictured a condition of affairs by which they would get a sum of money that would enable them to put up a nice building and outwardly have a fine show. They had been extremely fortunate in getting hold of a suitable building at Alvechurch, near Birmingham, and they hoped at some future date to commemorate the debt they owed to Mr. Pritchard, and to indicate their gratitude for the assistance he had rendered in the securing of those premises. As the first step towards showing their appreciation they had asked him to accept the presidency.

In seconding the proposition, DR. J. E. HURST remarked that he had probably known Mr. Pritchard as long as anybody in the Association, and he knew that he would be proud to occupy the position of President. The chairman had described Mr. Pritchard as something more than an industrialist. He was, and he ventured to think he would be the first, practical foundryman they had had as President. Not only was he practised in the art of founding non-ferrous alloys, but also in cast iron, which was his first major activity.

Having been with acclamation elected President, MR. PRITCHARD took the chair, and expressed his appreciation and sense of gratitude for the honour they had conferred upon him. As Dr. Hurst had indicated, cast iron was his first major activity, and whilst he had been seduced from the path of virtue somewhat, he still felt it would be his main preoccupation. He realised that in accepting the presidency he also accepted an obligation to the Association. He wanted to assure the members that he would make every effort to live up to the traditions of that high office. He had great hopes for the future of the casting industry, and felt that cast iron possessed possibilities not yet foreseen or envisaged by the engineer. In that respect he would like to put forward a personal thought that industry, and in a certain degree the engineer, was handicapped by its conception of cast iron. Cast iron was thought of in terms of rainwater goods, manhole covers, cooking ranges, etc., and he could not help feeling that if the Association could invent a new name for cast iron which lay between grey cast iron and steel it would be doing a great service, not only to industry but to the engineering profession. In conclusion, he thanked them sincerely for the honour conferred upon him, and assured them of his best endeavours on behalf of the Association and the industry as a whole.

Other Officers Elected

Mr. J. F. Davies and Mr. J. E. V. Jobson were re-elected, and Mr. W. B. Lake, J.P., Dr. T. Swinden, Mr. P. H. Wilson, and Mr. Fitzherbert Wright were elected Vice-Presidents, while the best thanks of the Association were accorded to Dr. W. H. Hatfield and Mr. P. Pritchard, retiring Vice-Presidents.

Returning thanks, MR. P. H. WILSON said he was in perfect agreement with the President that there was a great future for cast iron. In that direction members of the Association would not be found wanting, as he was sure that research would go on in order that they might meet all the requirements of industry.

Mr. J. T. Goodwin, M.B.E., M.I.Mech.E., was then elected an honorary member of the Association.

On the motion of MR. G. R. WEBSTER, seconded by Dr. A. B. Everest, the following members of the Council, retiring automatically under Article 27, and eligible for re-election, or elected during the year, were re-elected: Dr. S. F. Barclay, Dr. C. H. Desch, Mr. V. C. Faulkner, Dr. H. Hartley, Prof. D. Hanson, Mr. A. E. Pearce, Mr. N. R. Rees, Mr. J. J. Sheehan, and Mr. James Smith.

The best thanks of the meeting were also accorded to the Council, members of committees and sub-committees, Mr. Pearce and members of the staff for their services during the past year. The PRESIDENT suggested that, at any rate for the present year, members should express their gratitude in a rather more tangible form by securing all the support they could for Dr. Hartley's appeal for funds. While it might sound amusing, he seriously suggested that all industrialists connected with the manufacture and use of cast iron should be asked to voluntarily contribute a shilling per ton on their output. Thereby they would be supporting the industry and at the same time expressing in tangible form their appreciation of the efforts of the director and his staff. All the companies with which he was connected would be pleased to double their subscriptions to the Association for at least the next three years. Furthermore, if either at the end of that period or during it something additional was required he thought they would not be found wanting.

Votes of thanks to Mr. Pritchard for presiding over that meeting and to Dr. Hartley for his services that day and also at the Executive Committee meetings during the year were also passed. In proposing the former DR. HARTLEY assured the President that the Appeals Committee would double their contributions to the Association, at any rate for a period of three years. That was a very tangible action.

Cast-Iron Valves in U.S. Ships

Because bombs bursting close to ships have wrecked cast-iron valves connected with the lower sides of merchant vessels, thus adding to the risk of operations in danger zones, the U.S. Government has ordered the substitution of more ductile material for these components in all new tonnage.

British experience, it has been pointed out, showed that cast-iron connections to the sides of vessels below the freeboard deck tended to disrupt as a result of concussion from bursting bombs, although the ships themselves were not hit. A break in such a connection often permits an inflow of water which gets beyond control.

For that reason the general regulations and loadline regulations of the U.S. Bureau of Marine Inspection and Navigation have been amended to provide that in vessels where the keels were laid down on or after June 15, cast iron is not to be used for such connections, and that valves of cast iron are not to be secured to sea chests.

On vessels laid down before June 15, cast-iron connections to the vessels' sides, other than sea chests, are required to be replaced with more ductile material at the first overhaul or the first loadline renewal survey, unless in exceptional circumstances. Cast-iron sea chests reinforced with concrete or other approved material need not be replaced in these vessels.

Cast steel, it is stated, is found to be much more suitable than cast iron for connections of this kind, and also is preferable for sea chests connected directly to the sides of vessels.

THE AMALGAMATED ENGINEERING UNION National Committee, meeting at Leicester last week, unanimously carried a resolution to take the claim for an increase in wages of 4d. an hour to the National Arbitration Tribunal.

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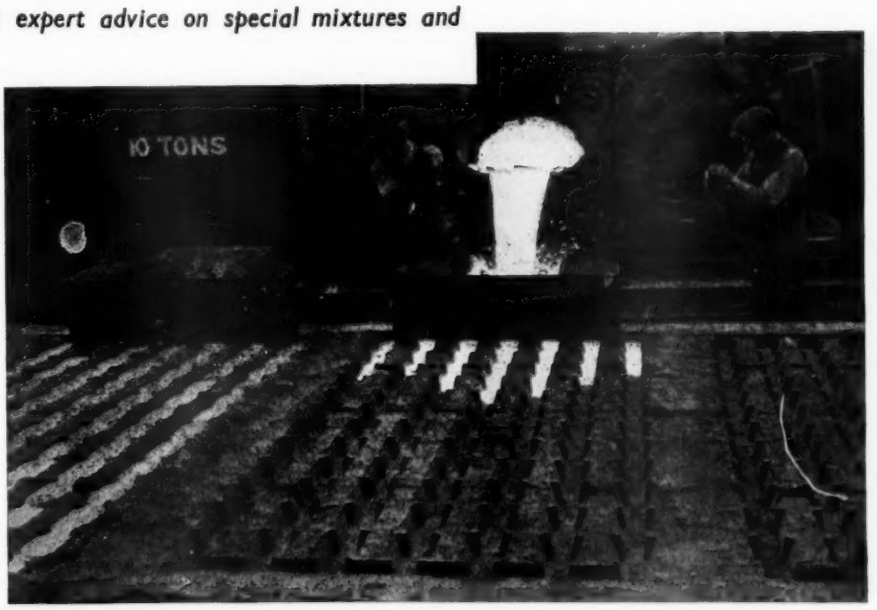
Users are invited to avail themselves of the Stanton Technical Service which offers free expert advice on special mixtures and other Foundry problems.

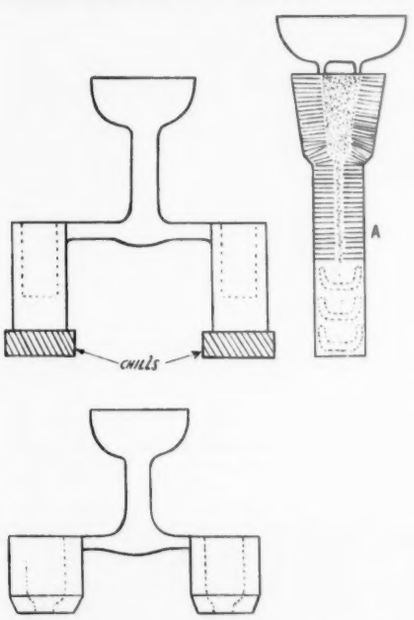


THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

Moulding Steam Valve Lids for Marine Service

ADDENDUM TO Mr. FRANK HUDSON'S I.B.F. CONFERENCE PAPER

Since the Paper was presented (see FOUNDRY TRADE JOURNAL for July 17) further experience has been gained relative to the production of small lids around 1 in. in diameter. It has been found that manufacturing these from vertically cast bar as shown in Fig. 5 is not too satisfactory, due to the presence of fine porosity at the centre of the closed end, as shown at A in the attached sketch. This porosity is due to shrinkage. Apparently the formation of the primary crystals in small sand-cast bars, or a rapid drop in fluidity due to temperature decrease in the alloys employed, is sufficient to prevent definite solidity being obtained throughout the section. Trouble in this direction has been overcome by production of individual castings, as illustrated herewith. It is important to note, however, that these modified methods only apply to very small castings, and are not successful with diameters over 1¼ in. when the methods previously described should be em-



ployed. If sound sand-cast bars are desired it appears preferable to make them in a manner similar to test bars, as shown at C and E in Fig. 9. Alternatively one could, of course, use wrought bars, but care will have to be taken in the selection of the material employed, as many of the cast alloys used for steam valve lids are not workable. It has been found that rolled Monel or "K" Monel bars provide a satisfactory substitute in the majority of cases for the production of small lids working in contact with stainless steel seats.

The discussion following the presentation of the Paper before the East Midlands Branch of the Institute (see FOUNDRY TRADE JOURNAL for November 6) drew attention to the large weight of metal going into the feeding heads in comparison to that in the castings, particularly if the runner bush was also allowed to retain metal. Whilst little can be done to reduce the size of feeding heads, care should be taken to see that pouring is stopped in time for the runner bush to empty itself in order to get the highest possible yield of castings to metal melted. There is, however, no positive method of seeing when the mould is full, and the best way of conserving metal during pouring is to

(*Continued in last column.*)

Blast Conditioning

STRIKING AMERICAN RESULTS

Reviewing the results which have been obtained by conditioning the air used in blast furnaces, E. K. MILLER, of Jones & Laughlin Steel Corporation, Aliquippa, Pa., at a recent meeting of the American Iron and Steel Institute, recalled that, in 1904, James Gayley built a refrigeration unit to freeze the moisture out of the blast of one of the Isabella furnaces of the Carnegie-Illinois Steel Corporation. Similar installations followed the Gayley plan, including one at Cardiff, South Wales. The Isabella dry blast plant operated intermittently for a number of years, but was abandoned in 1916, due to the high investment and maintenance cost involved; yet the need for a practical means of eliminating the variation in humidity of the blast air remained.

The effect of varying humidity in the atmosphere can be readily appreciated when it is considered that the daily average humidity in the Pittsburgh district varies from 1 to 8 grains per cub. ft. of air during the year, and considerable periods during the day are often 50 per cent. higher. When the humidity is 8 grains per cub. ft. of air, approximately 56 tons of water per day are charged into a large furnace. While the additional water is not desirable, the wide fluctuations in the amount of water have a far more detrimental effect on the operation of the furnace. In the south, the humidity is not only higher than in the north for longer periods, but the range of variation is considerably wider and the wide fluctuations are more frequent.

Long Period of Neglect

After the abandonment of the Gayley plant in 1916, there is no record of anything further being done on controlling humidity in the blast until 1939. At that time, the Woodward Iron Company of Alabama, taking advantage of the improved air-conditioning equipment then available, installed Carrier air-conditioning equipment on one of their blast furnaces to eliminate the high and widely-fluctuating humidity in the atmosphere which interfered with the uniform and smooth working of their furnaces.

The equipment is set to maintain the moisture content in the blast constant at 3 grains per cub. ft. As a result of the marked improvement obtained on the one furnace having the blast held uniformly to 3 grains, Woodward's have installed similar air-conditioning units on their other two furnaces. The satisfactory performance of the air-conditioning units at the Woodward plant was a factor that influenced the installation of a Carrier air-conditioning unit on one of the large Aliquippa furnaces, which has a hearth diameter of 28 ft. 6 in.

This unit was put into operation on February 16, 1941, on No. 3 blast furnace and changed to No. 1 blast furnace on March 1, but, due to the cold weather and the resultant low humidity, the refrigerating unit was not needed to remove moisture until April 2. Although the air-conditioning unit has been in operation too short a period to permit drawing any definite conclusions, April's daily iron production was approximately 5 per cent. better than in January and February, and the coke consumption was 3 per cent. less than in January and February.

It is probable that April's performance would have been even better than actually realised if the normal coke quality had been available. It was necessary to use coke made from coal that had been in stock for a considerable length of time as well as substitute a greater amount of raw coal for washed coal, as a result of the mines being shut down. It is expected that the equipment will permit an increase of approximately 9 per cent. in iron production.

New British Standard Specifications

The British Standards Institution announce that the following British Standards have just been published:—

B.S. 979—1941: Open-Hearth Melting Furnaces for the Refining of Steel.

B.S. 992—1941: Test Code for Fuel-fired Melting Furnaces Used in the Non-Ferrous Metal Industry.

The Institute of British Foundrymen has been represented on both the drafting Committees, and members of the Institute are invited to adopt these new specifications wherever possible. Copies of these specifications are obtainable from the British Standards Institution, 28, Victoria Street, London, S.W.1, at the following prices: No. 979, 5s. 6d. post free, and No. 992, 3s. 9d. post paid.

The Test Code for Open-Hearth Melting Furnaces for the Refining of Steel has been prepared to cover testing procedure and gives two forms of test, *viz.*:—Part 1: A short, simple code for carrying out, at a minimum cost, simplified industrial tests for evaluating the performance of furnaces as effective and economic units; and Part 2: A comprehensive code for the complete evaluation of the performance and the efficiency of furnaces.

The Test Code for fuel-fired melting furnaces used in the non-ferrous metals industry is framed on similar lines to the above specification, and also provides for two forms of test. Amongst other furnaces the Code is applicable to crucible furnaces for melting copper, brass, gunmetal and aluminium; pit furnaces of cast iron or plumbago for melting aluminium, type, lead and stereo metal; and reverberatory or potless furnaces.

Salvage and Disposal of Foundry Waste

(*Concluded from page* 345.)

medium and in the act of casting the cast iron absorbs about 33 per cent. steel cuttings. This process has been very successful during the past year. The product is a intimate mixture of cast iron and steel of high specific gravity and of uniformly low melting point. It makes an excellent base material for high-duty irons, giving a close-grained casting suitable for surfaces subject to wear.

Abrasive Wheels

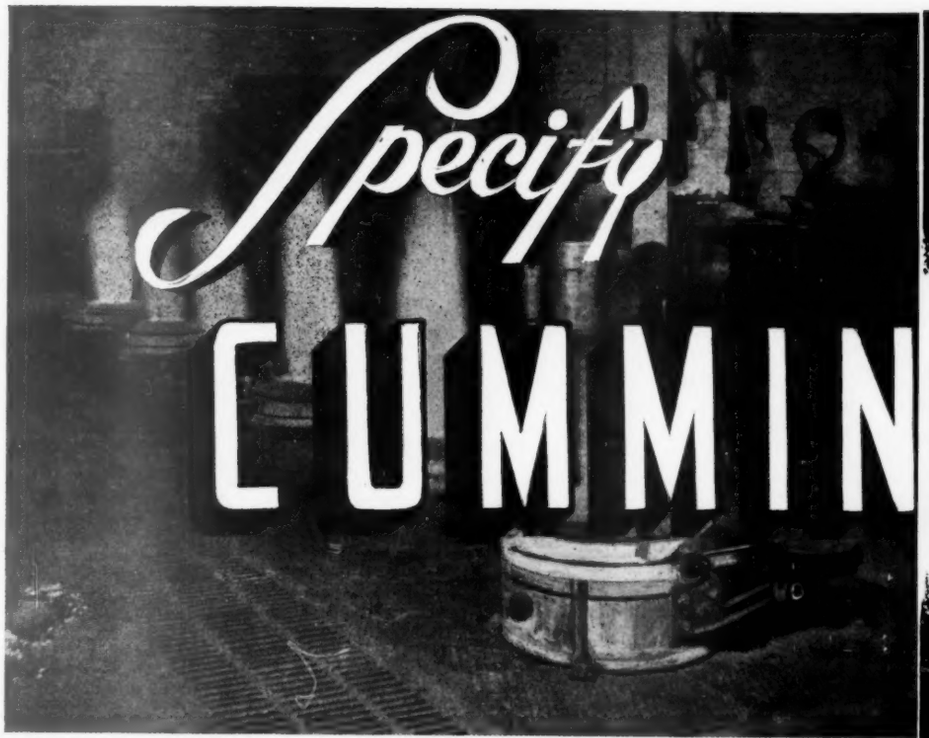
In all large engineering establishments there is a considerable quantity of broken grinding wheels of various types discarded regularly. Those of the silicon carbide type can be utilised in several ways in the foundry. It has been suggested that these be used as refractory bricks in certain positions such as tap holes and similar places. It is possible that they may be used as a ladle addition if ground up. The most promising use is the addition to the charges in cupolettes of small bores.

The addition of this material broken to about 2-in. size gives an additional amount of heat, which is very useful in the first charges. There is, therefore, a small amount of refractory slag produced which need not cause any trouble. In the writer's experience an increase of about 100 deg. C. has been observed.

Steam Valve Lids

(*Continued from first column.*)

fit a large runner bush which will hold just slightly more metal than required for the casting excluding head. It is then a relatively simple matter to commence pouring by filling the runner basin rapidly, and to interrupt pouring for a moment so that the runner bush can empty itself and then add further metal to bring the head up to the bottom of the jet runners.



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The Empire's Growing Contribution

Expansion of Australian Iron and Steel Industry

B.H.P. ANNUAL REPORT

Presiding at the annual meeting in Melbourne of the Broken Hill Proprietary Company, Limited, Mr. H. G. Darling (chairman) recalled that at their last meeting he mentioned that the whole of the company's resources would be behind the Government and the war effort. This promise, he said, had been faithfully carried out. Every request for help had been answered to the best of their ability, and the question of profit had at no time been a factor as to whether help should be given or withheld. All the shell and munitions steels had been supplied without profit to the company.

The nation was not prepared for war in September, 1939, said Mr. Darling. Industry in Australia was not equipped for the manufacture of guns and other warlike articles, nor had it experience in the special steels required and the technique associated with their manufacture. It had to learn, and learn quickly. When the history of Australian industry was written it would be a tale of great achievement. It could be said that in the space of two years Australia from possessing virtually no capacity for the production of munitions had been turned into a veritable arsenal.

Discussing the balance sheet, the chairman said that the items of £996,880 for depreciation and £456,330 for special depreciation might at first sight look high, but it was a very real cost in the steel industry; it enabled the company to take advantage of improvements in processes, technique and plant as they occurred and thus maintain its position. Progress involved constant and close study at home of the technique of the various processes in use at their works, and it had long been the policy of the board to augment this by sending the company's officers abroad to keep in close touch with improvements in steel practice throughout the world. It was only by providing for adequate depreciation that this comprehensive policy could be given effect to, and the industry in Australia kept in line with world practice. In this connection Mr. Darling recalled that in 1922, when the selling price of, say, angles was £18 10s. per ton, the company was not able to continue economically to produce steel. To-day, these angles were sold at £10 2s. 8d. per ton, and provided a reasonable margin of profit.

The Newcastle Steelworks had operated fully during the period, producing commercial steel in large volume as well as many and varied special steels for munition work. They were not now maintaining the export market for commercial steel established before the war, although a large volume of very profitable business could be done. The output was being mainly confined to Australian use, although it was still possible to look after their New Zealand customers to a limited extent. In their machine shops a considerable amount of war work had been done, mainly in the provision of hydraulic presses for munition making.

Magnesium Manufacture

The magnesium plant recently erected at Newcastle had commenced operations. Over twelve months ago the company realised that magnesium, even in minute quantities, would become unprocurable from elsewhere, and that supplies were of the utmost importance to Australia. Following upon a visit of their technical officers to London a process of manufacture was selected having regard primarily to the quickness of construction, and suitability to existing Australian technique. Information and plans to enable the installation to be put in hand were made available by the Murex Company, of London, and Mr. Darling took the opportunity of thanking the directors of that company, and those associated with them, for the generous help given Australia in a time of need. The production of magnesium in volume could be considered a "war" product, seeing that its pre-war use was limited, and it remained to be seen whether new uses for this metal would be forthcoming after the war. The future of the plant would depend upon this conjecture.

The ferro-alloy plant was another valuable addition to the Newcastle works, and had lived up to expectations. Production was in full swing. Formerly the products made in this plant were imported from Europe. Australia would soon be self-sufficient with these necessary steel-making alloys. Attention was now being directed to the manufacture of what was termed the lesser ferro-alloys, relatively small in quantity, but highly-priced commodities, and very necessary for the successful manufacture of high-grade tool steel and armaments. Some of these have already been produced, and others would follow. A cold rolling mill had been installed at Newcastle steelworks, and went into production last May. This mill was filling a national need, and was now supplying steel of certain characteristics which was formerly imported, but at the present time was unprocurable from abroad.

Whyalla Blast Furnace

The blast furnace at Whyalla was blown in on May 26, 1941, somewhat later than expected, due to the late arrival of essential machinery from England. This furnace went into production smoothly, and was now supplying foundry pig-iron for Australia. In addition to increasing the nation's pig-iron production, its advent would enable the steelworks at Newcastle and Port Kembla, particularly the latter, to produce more steel. Prior to the Whyalla blast furnace, the foundry pig-iron trade was supplied from Port Kembla.

Shipbuilding was proceeding as quickly as could be expected. For a start progress seemed slow, but shipbuilding was no different from any other manufacturing business when men had to be trained.

At Port Kembla a further open-hearth furnace (making the number now seven) had been built, and went into production at the end of May. This brought the ingot capacity of these works to 700,000 tons per annum. The stepping-up of the Government armament programme disclosed a shortage of forging capacity in Australia, so much so that without additional plant there could be no increase in the production of guns. It was decided that Port Kembla had the necessary advantages for a plant of this description, and the establishment of a modern forging plant was authorised. This was very rapidly built even though all equipment and presses had to be made in Australia. Guns of all descriptions were now being forged. This was not a profitable side of the steel business, and the plant was likely to become redundant after the war. The whole of the expense of establishing this plant has been borne by Australian Iron & Steel, Limited. Furthermore, an electric steel furnace had been built at Port Kembla for the production of guns and special steels of all descriptions. Kembla workshops had also been called upon to make many gun and munition making lathes, necessitating large purchases of equipment.

As a safety measure, steps were taken to open up various small iron-ore deposits in New South Wales.

Tata Developments

NEW KINDS OF STEEL BEING MANUFACTURED

The manufacture of bullet-proof armour-plate steel has been successfully developed by the Tata Iron & Steel Company, Limited, and such steel is being made for the requirements of armoured vehicles in India. Special steels have also been developed for armour-piercing bullets and shells, for machine-guns as well as for rifle and machine-gun magazines, and for drawing into telegraph wire. Research has been successfully pursued in connection with the welding of chrome molybdenum steel required for aircraft.

Outlining these developments in their annual report for the year to March 31 last, the directors of the Tata Company state that the advice and assistance of the company's experts has been fully placed at the disposal of the Government in connection with problems in the manufacture of special steels. As a result of its activities, particularly since the war, the company is now in a position to manufacture a large variety of special steels which had so far been imported.

A rapidly increasing proportion of the company's output during the year was taken up by the Government for war and urgent civil requirements. Prices for such supplies were regulated in accordance with the terms of an arrangement entered into with the Government at the beginning of the war. As a result of purchases by the Government, there was an acute shortage of steel for ordinary commercial purposes. The company's prices for such materials were raised to a small extent to meet the constantly increasing costs of raw materials and stores.

The third battery of Simon-Carves coke ovens was heated up in April, 1940, and the first oven was pushed in June, 1940. The Koppers coke ovens were shut down on September 1, 1940, after having been in operation for 24 years.

Making Acid Steel

During the year work was started on the erection of the new steel-making plant forming part of the current programme of expansion of the works. This plant will enable acid steel to be produced for the first time out of purely Indian materials. In spite of the delays occasioned by the war, the plant is expected to be in operation before the expiry of the current year. Two waterless gasholders have been erected, and the larger of them, namely, the blast furnace gasholder, has been working satisfactorily since September, 1940. Two electric steel furnaces were purchased from the Negapatam steel rolling mills and installed; they have proved invaluable in turning out special quality steel for supply to the Government. A separate foundry for producing ingot moulds and stools has been installed, an electrode-making plant put into operation, and a well-equipped workshop for the training of apprentices erected and brought into operation.

Besides the new steel-making plant, work on plant for manufacturing wheels, tyres and axles is in progress.

The company's gross profit at Rs. 7,48,78,625 is the highest earned by the company in its history. As compared with 1939-40, it shows a rise of Rs. 2,06,38,214, or a little less than 40 per cent. Net profit, after providing for income-tax, super-tax and E.P.T., and after setting aside Rs. 1,50,00,000 for depreciation, was Rs. 3,53,78,625, and Rs. 16,33,917 was brought forward.

Progress in Canada

Vancouver Steel Plant

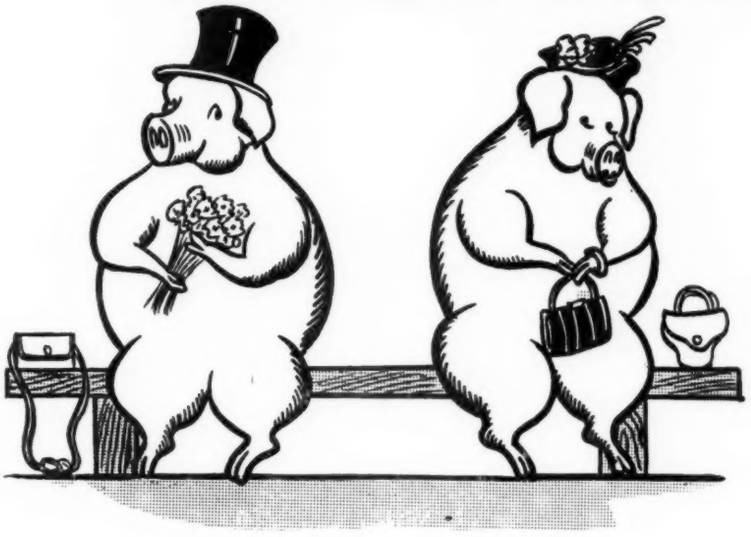
Following the announcement regarding establishing a steel plant at Vancouver to make use of the large supplies of scrap materials from British Columbia and Western Alberta, a wide campaign was undertaken to collect this scrap material and as a result between 25,000 and 50,000 tons have been accumulated, according to reports from Vancouver. Before the war this scrap was exported, chiefly to Japan, but with export embargoes there has been no market for this surplus. A survey of the British Columbia market reveals there is a dependable market for at least 15,000 tons of merchant bars and angles, etc., annually, while the new shipbuilding programme provides an outlet for an additional 18,000 to 25,000 tons. A mill with an annual capacity of 40,000 tons would find a ready market for its products. The opening of the Calgary plant by Dominion Bridge Company, which it was first planned to move to Vancouver, indicates that this company will supply a large part of British Columbia's needs from the Alberta works and also may draw heavily on the scrap supply as originally proposed.

Blast Furnaces in Canada

Steel Company of Canada, Limited, Hamilton, Ont., has blown in its new 1,000-ton blast furnace, which increases the company's rated capacity from 975 to 1,975 tons daily. The new furnace is producing at only three-quarters of its rated capacity, and for the present is confining output to basic iron. Canada now has a total of 11 blast furnaces, with an output of 4,875 tons per day. Canadian Furnace Company, Port Colborne, Ont., which blew out its furnace in July for repairs, is again in production, turning out malleable iron. Of the 11 blast furnaces in Canada, 10 were blowing last month.

CANADIAN STEEL OUTPUT in the first seven months of this year amounted to 1,345,751 tons, an increase of 19 per cent. over the 1,127,823 tons produced in the similar 1940 period and as against 691,290 tons in the January-July period of 1939. Production of pig-iron in the seven months was 727,556 tons, compared with 645,551 tons during the corresponding period of last year.

Delayed ... ...Action



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Warner's

Special Pig Irons

WARNER AND CO. LTD., CARGO FLEET, MIDDLESBROUGH

The Week's News in Brief

Trade Talk

THE ECLIPSE FOUNDRY & ENGINEERING COMPANY, LIMITED, is being wound up voluntarily. Mr. D. E. Campbell, 79, Lichfield Street, Wolverhampton, is the liquidator.

AN INQUIRY sent to the firm of Mr. John Every, of Lewes, has elicited that the collection of antique castings made by the late Mr. J. H. Every has been bequeathed to the Sussex Archæological Society.

AT A MEETING in London last week it was decided to form an association of diamond tool manufacturers which will have as its aim the consolidation of the trade within the framework of the national effort.

SIR MURDOCH MACDONALD, M.P. for Inverness-shire, has written to the Inverness-shire County Council suggesting that it should appoint a committee to consider the opening up of limestone quarries in the Highlands.

PRICES FOR borax and boric acid which came into effect as from last Monday are as follow:—Borax, commercial granulated, £31 10s. per ton, and boric acid, commercial granulated, £52 15s. per ton, packed in bags, minimum one-ton lots, carriage paid in Great Britain.

THE CHAIRMAN AND SECRETARY of the National Industrial Development Council of Wales and Monmouthshire are to meet representatives of the North Wales local authorities to discuss post-war reconstruction. The full co-operation of North Wales in the work of the council is sought.

THE BOARD OF TRADE have issued the Export of Goods (Control) (No. 39) Order, 1941, the chief effect of which is to consolidate previous Export Control Orders. The new Order comes into force on December 1 and sets out the position with regard to export licensing control at that date.

THE BOARD OF TRADE announce that applicants for licences to import goods consigned from China are now required to complete an undertaking that payment for those imports will be made through a bank in China approved by the Exchange Control Authorities and that payment will be made within a specified period.

THE PARTNERSHIP between Messrs. William Andrew Cameron and Henry Alfred Baker, carrying on business as toolmakers and general engineers at Colham Avenue, Yiewsley, West Drayton, under the style of Blenheim Tool Company, has been dissolved by mutual consent. Debts will be received and paid by Mr. Henry Alfred Baker.

THE BOARD OF TRADE have, with the approval of the Treasury, decided that, in respect of the period beginning December 3, 1941, and ending March 2, 1942, the rate of premium payable under any policy of insurance issued under the Commodity Insurance Scheme shall continue to be at the rate of seven shillings and sixpence per cent. per month.

CROMPTON PARKINSON, LIMITED, the Young Accumulator Company, Limited, and the latter's subsidiary, Associated Electric Vehicle Manufacturers, Limited, announce that the terms of the merger having been ratified by the holders of the requisite majority of shares of both the Young Company and A.E.V.M., the merger contracts have now become absolute.

ONE OF THE BRIGHTEST and best-equipped works canteens in Scotland was opened at Weir's Argus Foundry, Glasgow, recently. It provided a three-course meal for nearly 200 workers inside ten minutes on the first day. For 1s. the workers got soup, meat and potatoes and vegetables and a dessert, served by an expert staff. A few months ago the site in which the canteen is built was the pattern store, but it has been transformed into a place of real beauty and comfort. It is equipped with loud speakers, for relaying radio programmes, and is centrally heated. The firm also intends to introduce within the next few weeks complete sun-ray treatment for all workers employed in the factory.

RUSSIAN ORDERS were the salvation of the British machine-tool industry ten years ago, said Sir Edward Crowe, Comptroller-General of the Department of Overseas Trade from 1928 to 1937, in an address to the Royal Society of Arts. In the period 1929-31, he said, the British engineering industry as a whole, and the machine-tool industry in particular, was passing through a most difficult time. Several firms were on the verge of closing down. It was at this stage that the machine-tool industry was saved by Russia alone. Seventy per cent. of the value of our machine-tool exports went to the Soviet Union, and, roughly speaking, the orders placed at that time and in the following years amounted to no less than £10,000,000. Manufacturers wanted the orders, but they were frightened of the risks involved. The Export Credits Guarantee Department undertook practically the whole business. No defaults occurred, so that from a purely commercial point of view the transaction was eminently satisfactory. But much more than mere business was involved. We were desperately short of machine tools when war broke out, and he shuddered to think what would have been our position had it not been for those Russian orders. They kept our machine-tool industry going, and they compelled it to develop on modern lines.

THE NATIONAL UNION OF MANUFACTURERS feels restrictions on export trade are going further than is necessary. Sir Patrick Hannon, President of the National Union, in a letter to the Prime Minister, which has just been made public, told Mr. Churchill that there is a growing feeling of concern among manufacturers at the drastic cuts now being made in the established export trades to the Dominions and elsewhere, and anxiety as to the effect of these cuts on the vitality and recuperative power of the country in the difficult period after the war. They entirely agree that Lease-Lend materials must be regarded as a trust. They also know that all export trades must in war be absolutely dependent on the amount of material and transport which can from time to time be made available. It appears to them that the present cuts are going rather further than what, so far as they can see, is required at the moment, owing to either or both of these causes. Mr. Winston Churchill, in his reply, wrote that he is in full agreement with the National Union about the vital importance which our export trade will have in the period after the war, and he shares their anxiety that no unnecessary obstacles shall be put in the way of its maintenance while the war lasts. But it is not correct to attribute the drastic cuts in our exports to deference to the United States. The reduction of exports is due to our increasing preoccupation with warlike measures. The problem is to balance the merits of the various demands which are made upon the resources under our control.

Personal

LORD MOTTISTONE has accepted nomination by the Council of the Institute of Marine Engineers for election as president of the Institute for the year following the annual general meeting in March next.

MAJOR ANDREW HOLT has been appointed adviser on scrap supply to the Ministry of Supply. Major Holt was in charge of transport at the Ministry of Aircraft Production before joining the Ministry of Supply last July.

MR. J. H. FULLER, delegate from the Brodsworth branch to the Council of the Yorkshire Mineworkers' Association, has been appointed one of four workmen's inspectors of mines for Yorkshire. The others are Mr. A. Cookson (Frickley), Mr. F. Netherwood (Wakefield), and Mr. Arthur Roberts (Woodlesford).

MR. H. B. ROBIN ROWELL, director of R. & W. Hawthorn Leslie & Company, Limited, Hebburn-on-Tyne, was elected president of the Shipbuilding Employers' Federation in succession to Mr. J. M. Ormston, at the Federation's annual meeting in Carlisle. Mr. Rowell has been actively associated with the Federation for a number of years. He is vice-chairman of the Tyne Shipbuilders' Association, a vice-president of the North-East Coast Institution of Engineers and Shipbuilders, a member of the Technical Committee of Lloyds' Registry and of the Merchant Shipping Advisory Committee. He is a son of the late Sir Herbert Rowell, a former president of the Federation.

Wills

BLACK, THOMAS, of Chorlton-cum-Hardy, Manchester, engineer £26,123

HASWELL, R., of Sunderland, managing director of William Doxford & Sons, Limited, shipbuilders £30,892

RICHARDS, C. S., of Harpenden, joint managing director of the Metropolitan-Vickers Electrical Export Company, Limited £27,957

Widnes Foundry Centenary

The Widnes Foundry & Engineering Company, Limited, celebrated its centenary this year, the company having been founded by Mr. Thomas Robinson in 1841 and has been engaged during the past 100 years manufacturing heavy castings for the chemical industry and steel constructional work. The war conditions necessitated curtailment of any special celebrations, but the company organised a meeting for their employees in the machine shop, at which the directors and managers were present, and addresses were given by a representative of one of the Government departments, and a bomber pilot who had taken part in a recent raid over Berlin.

The addresses were greatly appreciated by the employees, and Mr. F. R. Stagg, chairman of the company, thanked the speakers and, addressing the meeting, briefly outlined the company's history, its share in the war effort, and pointed out the necessity for maintaining production in order to bring the victory all hoped for as speedily as possible.

Mr. Stagg announced that the directors had decided to make a gift to every employee with one year's service at June 30, 1941, of a week's salary or wages, those with under one year's service a proportionate gift, and the older employees of the company with over 20 years' service, of whom there were 68, additional recognition in the form of National Savings Certificates, which he handed to them personally—a gesture which was much appreciated by the older employees.

On the platform with Mr. Stagg were Mr. Arnold Carr, Mr. H. W. Secker and Mr. R. Credland (directors), Mr. R. W. Holt and Mr. J. Lee-Ure (managers), Mr. J. K. Stuart (Government department representative) and Sergeant-Pilot Hettrick and Sergeant-Gunner Cooling of the R.C.A.F. attached R.A.F.

Reports and Dividends

W. G. Allen & Sons (Tipton)—Interim dividend of 2½% (same).

Birmingham Small Arms Company—Dividend of 7½% (same) for the year to July 31.

Chloride Electrical Storage—Interim dividend of 5% on the "A" and "B" ordinary shares.

Guest, Keen & Nettlefolds—Interim dividend of 4%, less tax (2½%, free of tax) on the ordinary stock.

Lightalloys—Profit to June 30, £31,541 (£35,827); final dividend of 12½%, making 25% (same); forward, £5,717 (£5,175).

J. Lucas—Net profit for the year to August 7 last, £284,703 (£297,317); dividend on the ordinary shares of 15% (same).

Butler Machine Tool—Net profit for the year to September 30 last, £38,438 (£47,330); dividend of 12½% on the ordinary shares (same).

Brown, Bayley's Steel Works—Final dividend of 8% (10%), free of tax, on the ordinary shares, making 13% (15%), free of tax, for the year ended July 31 last.

Cochran & Company (Annan)—Net profit for the year to June 30, £41,995 (£54,724); taxation, £33,711 (£27,460); payments under War Damage Act, £900; A.R.P., £1,324; final dividend of 2½%, making 4% (5%); forward, £851 (£610).

Smith's Stamping Works—Net profit for the year to August 2, after all provisions, £18,633 (£29,504); brought in, £58,373; dividend of 10% (same); forward, £64,506. The subsidiary, Smith-Clayton Forge, shows a net profit of £12,271 (£13,764), which has been carried forward in its accounts.

Murex—Trading profit for the year to June 30, £553,091 (£490,440); reserve for taxation, £370,000; net profit, £213,222 (£224,055); ordinary dividend of 20% (same); to reserve, £75,000; reserved against advances to a subsidiary, £31,000; forward, £107,145 (£103,423).

Contracts Open

Belfast, November 29—Iron pipe castings; cast-iron surface boxes; gunmetal couplings, stopcocks, etc., during the year 1942, for the Belfast City and Water Commissioners. Mr. D. M'Garrigle, secretary, Water Office, Belfast.

Cork, December 3—Iron, steel, non-ferrous metals, castings, and house and smiths' coal for six months from January 1, for the Harbour Commissioners. Mr. E. Gayer, general manager, Harbour Office, Cork.

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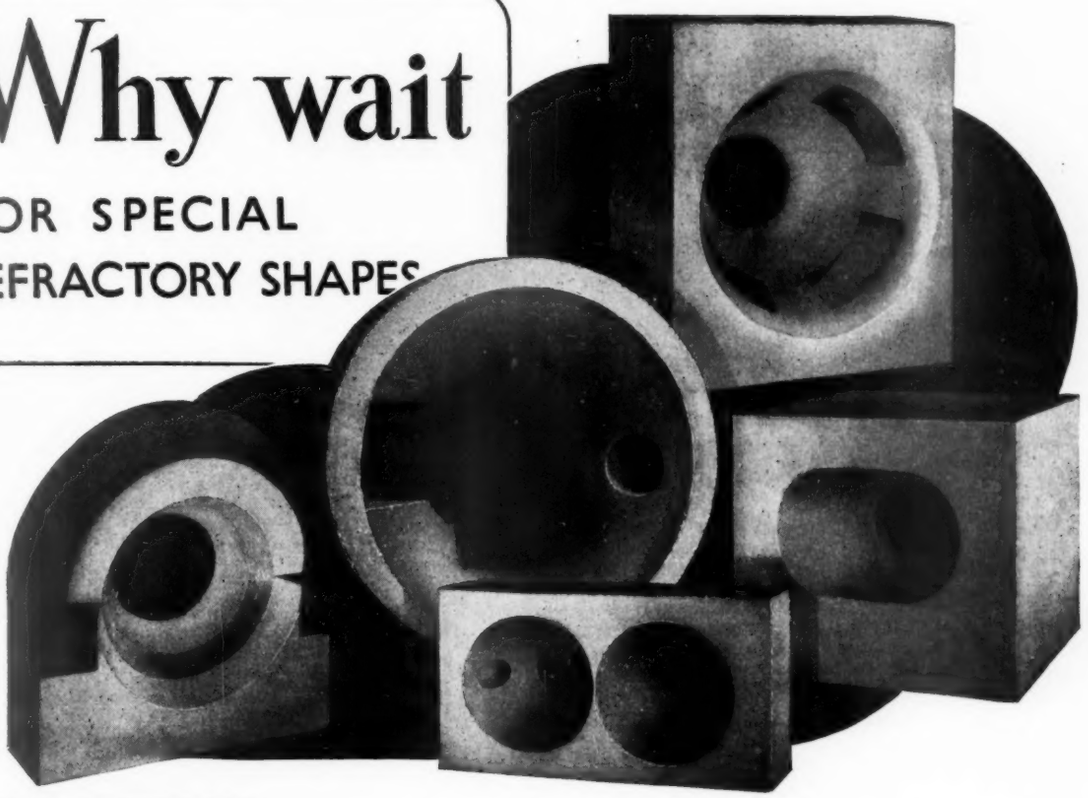

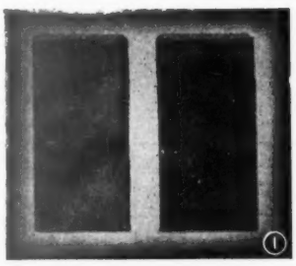

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NO SHRINKAGE. Illustration (1) shows two 9 x 4½ x 3 in. blocks cast in moulds and dried at atmospheric temperature. One was fired to 1500° C for four hours. Both specimens are exactly the same size.

STRENGTH. Illustration (2) shows two test pieces cast in moulds, allowed to dry at atmospheric temperature and one heated to 1,000° C. Tensile strength results—*Unfired*, 550 lbs. per sq. in. *Fired*, 1312 lbs. per sq. in.

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ACID-PROOF REFRACTORIES: *Obsidianite, Losol.*

INSULATION: *Amberlite* Bricks, Cement and Concrete.
SILICA BRICKS: *Lowood, Meltham, Allen, Quartex.*
CEMENTS: *Sintex, Durax, Pyrolyte.* PLASTICS: *Durax, Rotaline. Plastic K-N., Glendoline, Ground Ganister, Steel Moulders' Compositions.* SILLIMANITE: Tank Blocks, Bricks and Cements. SANDS: Moulding, Brick Facing, Silica, Glass.

Raw Material Markets

Deliveries of iron and steel to priority undertakings are well up to schedule. Production is closely regimented to the needs of the war effort. Iron and steel makers are obtaining adequate quantities of raw materials, and the position in this respect is very gratifying. Hematite is being conserved as much as possible by the Control authorities, who are releasing supplies only when it is impracticable for alternative grades to be utilised, and in any case the work for which the material is required has to be of a specially important character. Imported ores, of course, are necessary in the manufacture of hematite, whereas other grades of iron which can be made to fulfil the purpose of hematite reasonably satisfactorily in certain instances are made from ores located in this country.

Pig-Iron

MIDDLESBROUGH—Conditions in the foundry trade on the North-East Coast are variable; as has been the case since the outbreak of the war, the heavy foundries are the best placed for work on account of their being called upon to meet the insistent demands of Government departments. Light-castings makers, on the other hand, cannot share very extensively in this type of work, and there is little else to compensate them for the loss of a considerable portion of their normal domestic trade and export business. Common foundry iron is arriving very satisfactorily from the Midlands, and licences are granted freely; output of special refined qualities has been appreciably stepped up recently, but there is a full demand for these grades. The hematite situation is undoubtedly improving, but the larger output does not mean that the Control is any the more willing to allocate hematite indiscriminately, and stocks are being accumulated as a safeguard against the future.

LANCASHIRE—Derbyshire and Staffordshire No. 3 brands of foundry iron are being taken up on a fair scale by Lancashire consumers, but consumption is held in check by the quiet conditions prevailing among the light-castings and jobbing foundries, many of which are unable to work full time. Heavy engineers, machine-tool makers, etc., are briskly employed, chiefly on urgent work for Government departments, and replacement orders are forthcoming steadily for these concerns. Special refined grades of iron are still in good demand and supply, but the hematite position, although rather less tight, is still difficult, and users who can make use of alternative descriptions of iron are being strongly urged to do so.

MIDLANDS—With heavy engineering concerns operating to capacity, the demand for foundry iron is fully sustained. This section of the industry is inundated with business for Government departments and other priority purchasers and is booked up as far ahead as it is possible to see at the moment. Low- and medium-phosphorus irons, together with hematite, are in strong demand and there are insufficient supplies to meet all requirements, but a certain amount of ingenuity in varying furnace mixtures has relieved the position considerably and all urgent demands are being promptly satisfied. High-phosphorus and refined grades of iron are now extensively utilised in the heavy engineering trade and, despite this, there are ample tonnages to meet the limited needs of the light-castings manufacturers, most of whom are unable to procure enough business to keep their plant in continuous operation. Very strict conditions still govern the distribution of hematite, which is withheld unless its use is imperative.

SCOTLAND—With the exception of hematite, supplies of iron are reaching consumers steadily, all requirements being met in full. Very busy conditions obtain at heavy and marine engineering establishments, but the amount of work available to light-castings makers continues to be very much under peacetime standards, as many of their outlets have been severed, and the loss of export trade has been a serious blow. High-phosphorus iron is entering this area from the Midlands, deliveries being very good. In normal times, of course, a considerable volume of Cleveland foundry iron is used in this district, but production of this type of iron has been suspended.

Coke

It was expected some months ago that there would be a revision of the price of foundry coke, but such was not the case and there is now a revival of talk in market circles in this connection. Any change will, of course, be in an upward direction, but it is unlikely that there will be any substantial increase in the current quotation of 62s. 9d. per ton for Durham best foundry fuel, delivered to Birmingham and Black Country stations. Liberal supplies of coke are reaching consumers.

Steel

Demand for ordinary mild steel is tending to fall away, owing to the rising consumption of better qualities of steel which are needed for many phases of war production. Many of the producing units which were engaged on the manufacture of the former have been transferred to those grades of steel which have superseded them in importance in the output of munitions. It is unlikely that the maximum demand for alloy steels has yet been attained and the authorities are keen that the make be raised still further. A considerable amount of additional plant is constantly being brought into commission. Joists and sections are now available more promptly, while some of the plate mills could take on more work, though, for the most part, they are well engaged, as are the sheet mills.

Scrap

Consumers of iron and steel scrap, and the steelworks in particular, are displaying much interest in the future supply of this valuable raw material, despite the fact that at present they are getting excellent deliveries. It is appreciated, however, that more and more reliance will have to be placed on home-produced scrap, as imports have already been drastically curtailed. If the optimum is to be achieved, strenuous efforts will have to be made to expand the collection of scrap metal in this country, as when existing stocks and fresh supplies of foreign metal have been liquidated, it is probable that there will be a deficiency in the supply. Certain descriptions of scrap are very quiet, users having accumulated large stocks, but there is a ready demand for many varieties. Foundrymen are mostly in the market for heavy cast-iron scrap, while many engineering foundries would willingly accept better deliveries of first-class machinery metal.

Metals

COPPER—Good deliveries of copper continue to be made to works employed on war contracts and other important business, and the position is assisted by fairly large arrivals of American semi-finished materials. The American Copper Institute reports that production of crude copper in the United States in October totalled 85,546 short tons, against 82,071 tons in the previous month. Refined output was 86,617 (80,961) tons, while deliveries to domestic consumers amounted to 121,313 (120,429) tons. Export shipments were 144 tons in October and nil in September. Refined stocks held by producers at the end of October totalled 67,260 tons, compared with 63,670 tons at the end of the previous month. It is reported that the American Defence Plant Corporation is spending $9,000,000 for the construction of facilities in Arizona, the annual capacity of which will be 46,000,000 lbs. of electrolytic copper and which will be leased to the Miami Copper Company.

It is understood that Rhodesian copper producers will take steps to urge the authorities to review the effect of the Excess Profits Tax on their operations and will press for the setting up of a judicial tribunal for determining the treatment of certain "hard cases," such as was done in the last war. Many producers, while endeavouring to meet requests for the production of maximum outputs, are working under difficulties wrought by the tax, leaving them with insufficient cash to carry on their activities with the desired efficiency. It is believed that Rhodesian copper producers have been supplying the British Government with metal at virtually pre-war prices, and they have had to reduce their dividends for the past year. The Mufulira concern, for example, has omitted any distribution, while Roan Antelope has cut its total dividend by 50 per cent. to 10 per cent., and Rhokana Corporation's total is 30 per cent., against 40 per cent. for the previous year. If it is apparent that excess taxation is tending to hamper the war effort in this direction, it is to be hoped that the authorities will not be slow to ameliorate the burden.

TIN—The absence of any further news regarding the rumour that export licences might again be issued has caused some easiness in prices on the London Metal Exchange. Stocks of tin in official warehouses recently reached their highest level of the year, and this alone is good reason to believe that the Government will revise its tin-export policy. American sources of supply have been affected by Russian buying in the East, and the United States would doubtless be only too glad of the opportunity to resume purchases in Great Britain.

Don Carlos V. Aramayo, chairman of Aramayo Mines in Bolivia Company, in a statement read at the company's annual meeting recently, referred to the contract between Bolivian tin producers and the U.S. Metals Reserve Company signed on November 4, 1940. He said that the various Bolivian producers, including their company, agreed to sell a total of 18,000 tons of fine tin a year to the Metals Reserve Company for five consecutive years at a price which was fixed for the first year at 48½ U.S. cents per lb. of fine tin. This price, which had since been renewed for six months up to December 31, 1941, was equal to £269 11s. 7d. per long ton at the official rate of $4.83. The contract was subject to any adjustments of quotas that might in the future be made by the International Tin Committee, which had always had the complete support of all Bolivian producers as well as the Bolivian Government. Although numerous difficulties, mostly of a mechanical nature, continued to arise in the application of the Metals Reserve contract, he was satisfied that the agreement would prove in the long run to be highly beneficial to both contracting parties.

Tin prices on the London Metal Exchange during the past week have been as follow:—

Cash—Thursday, £257 5s. to £257 10s.; Friday, £257 15s. to £258; Monday, £257 to £257 10s.; Tuesday, £256 10s. to £256 15s.; Wednesday, £256 5s. to £256 10s.

Three Months—Thursday, £260 15s. to £261; Friday, £260 15s. to £261; Monday, £261 to £261 5s.; Tuesday, £260 15s. to £261; Wednesday, £260 10s. to £260 15s.

SPELTER—Demand for spelter in connection with the defence programme is very substantial, but adequate deliveries appear to be despatched to priority consumers. It may be possible to expand stocks in this country, although it is difficult as yet to foretell the effect which our aid to the Soviet Union will have on supplies. Meanwhile, distribution is very carefully controlled, and non-essential users are not getting more than a small proportion of their requirements.

LEAD—Supplies of this metal are still very satisfactory, although it is not quite so easy for non-priority buyers to acquire the metal as it was a few months ago, when the question of rendering aid to Russia had not arisen.

Applications for Trade Marks

The following list of applications to register trade marks has been taken from the "Trade Marks Journal":—

"OCTO"—Firebricks. BONNYBRIDGE SILICA & FIRECLAY COMPANY, LIMITED, Bonnybridge, Stirlingshire.

"TIPPEX"—Preparations for welding metals. SAGMA, LIMITED, 19, The Avenue, Hatch End, Middx.

"KENNAMETAL"—Alloys. GEORGE H. ALEXANDER MACHINERY, LIMITED, 82, Coleshill Street, Birmingham, 4.

"ENVOY"—Firebricks for export. BONNYBRIDGE SILICA & FIRECLAY COMPANY, LIMITED, Bonnybridge, Stirlingshire.

"HICARO"—Hand tools. JOSEPH PERKINS & SONS, LIMITED, Albion Works, Astwood Bank, Redditch, Worcs.

"ROSCRU"—Screw pumps. MIRRLEES, BICKERTON & DAY, LIMITED, Bramhall Moor Lane, Hazel Grove, Stockport, Ches.